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See publication: Articles in journals, papers in proceedings, or chapters in books are found in the publication cited. These publications may be in libraries or purchased from publishers or dealers.

SAE: Society of Automotive Engineers, Dept. HSL, 400 Commonwealth Drive, Warrendale, Pa. 15096.
Order by title and SAE report number.

TRB: Transportation Research Board, National Academy of Sciences, 2101 Constitution Ave., N.W. Washington, D.C. 20418.

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ERRATA SHEET

HS-016749 In abstract: "monotonous" should be "monotonous".

HS-016752 and HS-016814 In abstracts: "susceptability" should be "susceptibility".

HS-016758 In abstract: "occurance" should be "occurrence".

HS-016837 Published in: "Automotive Engineering" vice "Automotive Engineering."

HS-016853 In abstract: "compability" should be "compatibility."

HS-016859 In abstract: "statictically" should be "statistically."

HS-016886 In abstract, second sentence: Eliminate phrase "are legislation."

HS-016887 Abstract, last sentence, should read:
"The controlled studies, of considerably smaller scope than the rural study, should include an investigation of the significance of alcohol intoxication in accident causation."

ABSTRACT CITATIONS

HS-016 733

1974 NATIONAL TRANSPORTATION REPORT. CURRENT PERFORMANCE AND FUTURE PROSPECTS. SUMMARY

Information is presented that is useful in the formulation of intercity air, water and ground transportation policies and in the evaluation and realignment of programs at the national, state, and local levels of government. The main objective was to provide data for assessing the public financing needs of various modes of transportation. More specifically, the report assesses the effects of future public expenditures on the level of service provided to transportation users and evaluates ways of improving performance of the Nation's transportation system. A secondary purpose is to examine the feasibility of assessing the performance of the transportation system, using a number of uniformly specified measures, whereby a smaller subset from the large number of performance items are selected for further refinement and used in the future for measuring and monitoring transportation service consistently by all levels of government. The information used as the basis of this report is derived from input supplied by federal, state, and local government agencies, as well as private industry.

Dept. of Transportation, Washington, D.C. 20590
1974; 271p
Availability: GPO

HS-016 734

AN ENGINEER'S GUIDE TO FRICTION

The theory of friction is reviewed and the various factors that influence it are discussed, specifically: temperature, surface films, surface hardness, lubrication, surface roughness, crystal structure, load, and sliding speed. Measurement and application of friction coefficients are discussed, as well as some of the common misconceptions in the use of these coefficients. Other sections are devoted to friction in metalworking operations, and rolling-contact friction.

by W. A. Glaeser
Defense Metals Information Center, Battelle Memorial Inst.,
Columbus, Ohio 43201
Contract F33615-69-C-1343
Rept. No. DMIC-M-246; 1970; 14p 15refs
Sponsored by Air Force Materials Lab, Wright Patterson
AFB, Ohio.
Availability: Defense Documentation Center, Cameron
Station, Bldg. 5, 5010 Duke St., Alexandria, Va. 22314; CFSTI
Springfield, Va. 22151

HS-016 739

STATE OF WEST VIRGINIA INTEGRATED INFORMATION SYSTEMS. TRAFFIC RECORDS/CRIMINAL JUSTICE. TASK COMPLETION REPORT. TASK 103. CONCEPTUALIZATION

The completed conceptualization task which was oriented toward producing the best possible conceptual system configurations is reported. The objective's elements were: to identify all governmental agencies to be included; to perform an over-

view examination of the interrelationship of traffic records and criminal justice functions, as they react to each other and to governmental operations; to identify the activities, components, and limitations of other operational information systems, and perform a state-of-the-art survey to determine the applicability of other systems and acquisition cost/feasibility; to conduct a survey of user wants and needs, identifying desired and required systems outputs and their relationship to the decision making process; to establish a baseline of standards by identifying the requirements set forth by national agencies and organizations which apply to the design and operation of such an information system; to identify the data bases which are to be included, by correlating the results of the state-of-the-art survey and user wants/needs survey with defined standards relating to data base management; and to design alternative conceptual configurations of a traffic records/criminal justice information system by incorporating all information gathered as a result of task activity and combining it with information supplied by the systems analysis task.

Digital Resources Corp., Charleston National Plaza, Suite 926,
Charleston, W. Va. 25310
Rept. No. 3; 1971; 230p 56refs
Availability: Project Director, Traffic Records and Criminal
Justice Information System Project, 922 Quarrier St.,
Charleston, W. Va. 25301

HS-016 740

UTAH TRAFFIC ACCIDENTS AND ACCIDENT RATES, 1974

Information is presented on motor vehicle accidents and accident rates in Utah on federal-aid and state highways. The data was compiled from accident reports submitted by drivers involved in accidents resulting in injuries, fatalities, or damage in excess of \$200. A method of comparison of degree of safety on highways was used that related the number of accidents to degree of exposure to accidents. The method provides accident rate information which shows the number of accidents per million miles of vehicle travel and was also designed to show the same accident rate relationship regardless of fluctuations in traffic volume. Each route covered was also divided into sections to allow accident rates to be determined and accident potential identified for a specific highway segment. The computer generated listings provided include the following information; county, route number of the road, milepost, description of the highway segment, length of the segment, average daily traffic, number of accidents (with injury, fatality, and property damage breakdowns), total number of persons injured and killed, and a yearly accident rate for 1972, 1973 and 1974.

Utah State Dept., Accident Records Unit, Rm 1104, First
Security Bldg., 405 S. Main St, Salt Lake City, Utah 84111

Prepared in cooperation with the Federal Hwy. Administration
Availability: Corporate author

HS-016 741

AIR POLLUTION BY COMMUTER TRAVEL ON STATEN ISLAND

A computer model was developed to estimate the emissions produced by the Staten Island transportation system: cars, buses and the Staten Island Rapid Transit System (SIRT). The primary source of information for this model was the 1970 census. The model permitted comparison of existing or proposed transportation system emission levels to the air quality requirements of the Clean Air Act of 1970. In the model, the worker flow patterns are represented by 10 origin-destination travel matrices which include the mode of travel. Four alternate measures (and related assumptions) to reduce the level of commuter vehicle emission were analyzed: improving bus service thus reducing the use of cars by 25%; intra-island SIRT service and improving bus service thus reducing car usage by 40%; improving bus and intra-island SIRT service plus a subway link to Manhattan thus reducing both car and bus use by 40% each with an 80% increase in SIRT usage; and no improvement in mass transportation but compliance with 1975 and 1976 national emission standards. The conclusion was that the most significant improvement in reducing pollutant emissions can be made by requiring automobiles to satisfy the 1976 emission standards.

by R. D. Smith; L. P. Winkler; A. M. Levine
 Publ: Traffic Quarterly v29 n2 p301-12 (Apr 1975)
 1975; 18refs
 Availability: See publication

HS-016 742

ENO FOUNDATION BOARD OF DIRECTORS AND BOARD OF CONSULTANTS. REPORT ON JOINT CONFERENCE, NOVEMBER 6 AND 7, 1974

Two major topics were explored: transportation safety (commercial jet aircraft, automobiles and rapid rail) and the formulation of national transportation policy objectives. Under transportation safety, the alarming increase in the air carrier accident rate was presented, along with possible causes and solutions. Areas discussed concerning automobile safety included vehicle design, the impact of the gasoline shortage, the airbag restraint system, and related aspects of pedestrian and bicycle safety. The conclusion was that greater emphasis needs to be placed on safety by both the public and local government, along with increased enforcement of existing safety regulations. Rail car design was discussed, as well as overall safety systems at various levels of rapid rail operation automation. Rapid rail was shown to be consistently the safest form of travel. The objectives portion of the conference focused on national transportation policy, economic development and land use, and transportation financing policy. Transportation policy recommendations included the following: better management of existing highway systems through traffic reduction; the development of a more efficient, nonpolluting automobile; the development of an overall transportation network that is not only efficient but also has minimal negative environmental impact; existing interstate transportation regulation revisions; increased local involvement in transportation planning and financing; and the development of a larger transportation data base. It was seen to be desirable to finance public transit, in part, from special "ear marked", federal-aid funds, to augment local financing. State and local agencies, however, must also develop better cost-effective solutions to

their transit problems, such as better use of existing equipment and facilities, and improving the quality of existing equipment to encourage ridership. More emphasis needs to be placed on land use policy and local-federal interaction to provide for improved urban planning.

Eno Foundation
 Publ: Traffic Quarterly v29 p169-222 (Apr 1975)
 1975; 10refs
 Availability: See publication

HS-016 743

THE URBAN FREEWAY BASE-LANE SYSTEM

Driver behavior is cited as the cause for urban freeway traffic jams, rather than the configuration and size of the road. A base-lane system is proposed to keep drivers in the proper lane for the most expeditious traffic movement. The base-lane will be the rightmost freeway lane that does not carry predominately entering or exiting traffic (a lane will be provided for these purposes). A left lane will be provided for passing only. Base-lane vehicles must keep up with the traffic flow, or move to the right lane. Lane pavement markings to distinguish the base lane; and driver information signs to achieve appropriate base, passing, and exit lane speeds and lane movement are explained. Base-lane driving rules should be enforced by police and motorists, by requiring expeditious lane switching, maintenance of maximum speed, and shepherding of traffic into the base-lane. The author states that the base-lane system is the only way to achieve urban freeway potential.

by D. R. Wulfinhoff
 Publ: Traffic Quarterly v29 n2 p285-300 (Apr 1975)
 1975
 Availability: See publication

HS-016 744

ON THE STUDY OF PERSONALITY FACTORS IN RESEARCH ON DRIVING BEHAVIOR

Pertinent research is reviewed and suggestions offered for further investigation of the relationship between personality characteristics and aspects of driving behavior. The involvement of personality factors in traffic accidents is supported by findings of psychiatric studies focusing on psychopathology, social psychopathy, stress, alcoholism, and accident proneness; and from other studies making use of psychological testing devices to measure components of personality. Further progress in clarifying the relationship between personality and traffic accidents may be achieved through the use of more appropriate validation criteria and more inclusive stylistic conceptions of personality.

by E. I. Signori; R. G. Bowman
 Publ: Perceptual and Motor Skills v38 p1067-76 (Jan 1974)
 1974; 47refs
 Supported by a grant from the Univ. Com. on Res., Univ. of British Columbia, Canada.
 Availability: See publication

EFFECTS OF CAFFEINE ON ALERTNESS IN SIMULATED AUTOMOBILE DRIVING

The effects of caffeine on four indices of driving performance in an automobile simulator were evaluated. Performance indices monitored were: response time to lead car decelerations; response time to lead car accelerations; response time to high-beam signals; and missed high-beam signals. Twenty-four normal, male subjects, ages 21 to 26 years, were given either 200 mg of caffeine or a placebo, 30 minutes prior to being placed in the simulator. After 90 minutes of driving, each subject ingested another dose of the medication taken initially, and then drove for a second 90 minute period. Both the initial and supplemental doses of caffeine significantly enhanced performance beyond that found with the placebo on all four parameters.

by E. G. Regina; G. M. Smith; C. G. Keiper; R. K. McKelvey
Grant PHS-GM-15904
Publ: Journal of Applied Psychology v59 n4 p483-9 (Aug 1974)
1974; 7refs
Performed at the Injury Control Res. Lab., Dept. of Health, Education, and Welfare, Providence, R.I. Supported in part by a grant from the Bristol-Meyers Co.
Availability: See publication; Gene M. Smith, Massachusetts General Hospital, Boston, Mass. 02114

HS-016 746

DAY ON WHEELS

Reports submitted by GSA regional architectural trainees are presented. The trainees participated in an exercise requiring them to spend one full day going about their normal assignments in a wheelchair. Insight was gained concerning problems encountered by physically handicapped employees of the Federal government. Barriers encountered included: curbs, entrance steps; revolving doors; too high placement of telephones, drinking fountains, and drawing boards; too narrow aisles in the cafeteria and between desks in the office; and inaccessible toilet facilities. Ways in which designers might better design to accommodate different types of handicaps include: uniformity and texture coding for the blind; ramps instead of curbs and steps for those confined to wheelchairs, as well as lowering of drinking fountains and telephones; and the addition of handbars, raising and redesigning fixtures in toilet facilities.

General Services Administration, Public Buildings Service,
Washington, D.C.
1975; 110p 13refs
Report on the Orientation of Young Designers to the Needs of the Handicapped.
Availability: Corporate author

HS-016 747

THE SCANDINAVIAN MYTH: THE EFFECTIVENESS OF DRINKING-AND-DRIVING LEGISLATION IN SWEDEN AND NORWAY

Swedish and Norwegian laws on drinking and driving have been differentiated from the laws of other nations by their use of prison as the routine penalty and by the prohibition, not of impairment while driving, but of attaining a specific level of blood alcohol, determined by scientific tests of bodily sub-

jecting and driving in Sweden, Norway, Finland, and Denmark are reviewed, and arguments made in favor of the deterrence hypothesis are summarized. These arguments are found to be weak and unconvincing. Interrupted time-series analysis was applied to a series of motor-vehicle casualty data from Sweden and Norway which, according to the deterrence hypothesis, would be expected to show changes corresponding to the legal reforms in question. Such changes were not found. Lack of support for it does not disprove the deterrence hypothesis, which has the merit of common-sense plausibility, but it indicates that the current widespread faith is without firm grounding. From the practical point of view, it is suggested that the continuation of current policy in Sweden and Norway, and its adoption elsewhere, should be more tentative and subject to more scrutiny and critical evaluation than has been the case to date.

by H. L. Ross
University of Denver, Colo.
1975; 49p refs
To be published in the Journal of Legal Studies v4 n2 (Jun 1975). Supported by a grant from the Insurance Inst. for Hwy. Safety, Washington, D.C.
Availability: Insurance Inst. for Hwy. Safety, Watergate 600, Washington, D.C. 20037

HS-016 748

RELATIONSHIP BETWEEN AGE AND HAZARD PERCEPTION IN AUTOMOBILE DRIVERS

Two experiments, one using 20 women and one with 18 men and women, were conducted to test the hypothesis that if younger and older drivers perceive danger differently, they may differ in their patterns of hazard perception relative to roadway features and traffic encountered while driving. Hazard perception was studied by assessing reports of potentially dangerous situations encountered while driving. The results of both tests showed that older drivers perceived relatively more danger stemming from moving objects, while younger drivers perceived relatively more danger in non-moving objects. Driving skills measured in terms of steering-wheel reversals and speed changes did not vary with age, leading to the conclusion that skill itself was not a factor in the differential perception.

by S. M. Soliday
Publ: Perceptual and Motor Skills v39 p335-8 (Aug 1974)
1974; 5refs
Conducted as part of the project Driver License Road Testing (DL-69-001 (002), contracted with the North Carolina Dept. of Motor Vehicles. Sponsored by the North Carolina Governor's Hwy. Safety Office.
Availability: Personal author, Dept. of Industrial Engineering, North Carolina State Univ., Raleigh, N.C. 27607

HS-016 749

AN EXPERIMENTAL TEST OF THE ABILITY TO REMAIN ALERT IN MOTONONOUS CONDITIONS: VALIDITY CHECK BY MEANS OF A STANDARD INTERVIEW

The quantitative prediction of the hazards of traffic accidents under the influence of psychotropic drugs is investigated. Ninety young and rather inexperienced professional drivers were subjected to both a psychomotor vigilance test, simulat-

specific symptoms of a tendency to vigilance failures. Performance in the laboratory test related to individually different tendencies to vigilance failure is reflected in the behavior of the subjects in characteristic life situations (assessed on the basis of their statements). A significant correlation is found between the percentage of missed signals and the number of symptoms given by the subjects in the interview. From the symptoms of the tendency to vigilance failures, near-accidents due to this tendency are selected as being the most serious symptom. Near-accidents due to drowsiness are situations in which no accident occurs but the car slides to the right edge of the road or into the oncoming lane. The results of the tests and interviews show the applicability of the test as a model of monotonous situations arising in natural conditions.

by K. Kopriva; E. Frantik; M. Horvath
Publ: *Activ. Nerv. Sup. (Praha)* v16 n2 p117-9 (May 1974)
1974; 3refs
Availability: See publication

HS-016 750

HAND-CONTROL DRIVERS: COMPARISON OF DRIVING RECORDS AND INSURANCE RATES WITH THOSE OF NONRESTRICTIVE DRIVERS

The 663 hand-control drivers in Washington state were surveyed as to driving records, insurance coverage and insurance rates. Of these, 104 were matched with nonrestricted drivers on 5 variables: age, sex, geographic area, number of violations, and number of accidents. The unrestricted drivers were then surveyed and further matched for size of automobile within one year. Five of 14 variable combinations were found significantly different. The hand-control driver was more likely to be a single man who owned a larger automobile. The hand-control driver carried a lower level of insurance coverage but paid a higher insurance premium per year. While insurance companies state that they do not discriminate against the hand-control driver, the study suggests that they do not consider the characteristics of the hand-control driver, but instead combine all handicapped drivers together and charge a higher premium without supporting actuarial data.

by M. L. Hymen
Grant DHEW-16-T-56818-10
Publ: *Arch. Phys. Med. Rehabil.* v55 n10 p443-7 (Oct 1974)
1974; 13refs
Adapted from master's thesis, Univ. of Washington.
Availability: Personal author, Santa Clara Valley
Rehabilitation Center, 751 South Bascom, San Jose, Calif.
95128

HS-016 751

ROAD SAFETY PLANNING FOR OVERTURNED BUSES (AZ UTASBIZTONSAG TERVEZHETOSEGE AUTOBUSZ BORULASA ESETERE)

The safety of passengers during a bus overturning accident is examined with a view toward determining dimensions in bus design and quality controls. By describing the possibilities of theoretical studies, this study also helps in the preparation of accident reviews involving overturned vehicles; in assessing the experiences gained; and in making appropriate forecasts for road safety in the planning stage. Actual bus accidents must be studied from two standpoints. Study of the accident

that has taken place, including the circumstances of the accident and deformation of the vehicle, are valuable sources of deductions for designers. At the same time, data analysis of accident statistics provides an answer to the question as to the frequency in which different forms of accidents occur. The distribution of the two basic types of bus accidents, collisions and overturning are summarized. The accidents are classified into those involving pedestrians, smaller vehicles, collision with a solid object comparable to a bus, and actual bus overturning. When studying accidents with overturned vehicles a distinction is made between those tipped on their side and those turned over on their roof. The former are not accompanied by any appreciable deformation of the body and injuries are caused more by collision between passengers and their collision with the bus structure, which can only be avoided by the use of restraints. Turning over into the roof can cause extensive deformation of the window field and roof causing greater injury severity. Though overturning is a rare occurrence, a common trend in bus construction is to make the roof structure lighter and to make the pillars more slender, with greater window area. This theoretical study is based on a bus overturning on a given slope, starting from two actual accident situations: falling from an overpass and rolling off the shoulder. Equations are then developed to simulate structural deformation.

by A. Voith
Publ: *Jarmuvek, Mezogazdasagi Gepek* v21 n7 p258-64 (1974)
1974; 25p 16refs
Text also in Hungarian.
Availability: See publication

HS-016 752

BASIC BIOMECHANICAL PROPERTIES OF THE HUMAN NECK RELATED TO LATERAL HYPERFLEXION INJURY. FINAL REPORT, MARCH 1975

Properties of the human neck which may influence a person's susceptibility to "whiplash" injury during lateral impact have been studied on 96 normal subjects. They were chosen on the basis of age, sex, and stature, and the data grouped into 6 subject groups based on sex and age. Stature served as a secondary variable, with each group of 16 subjects being matched to obtain a group average. Data included measurements of: head, neck, and body anthropometry in standing and sitting positions; stretch reflex time of sternomastoid muscles; head/neck response to low-level acceleration; voluntary isometric muscle force in the lateral direction; and three-dimensional range of the head and neck motion. Data were presented in a format applicable to biomechanical modeling of the seated human occupant and have been used in the MVMA-2D vehicle model adjusted for side impact at 10 and 30 mph. The following were some of the major achievements and results observed: traditional anthropometry measures indicated excellent matching of the subjects to that of both the sagittal plane study and the Public Health Service; locations of major body masses for the 6 groups were obtained by anthropometry measures; three-dimensional photogrammetry techniques were successfully used in conjunction with these measurements to describe the seated car occupant; three-dimensional orthogonal photogrammetry techniques were successfully used to determine Euler-angle statistics for range of motion of the 6 groups; stretch reflex times of the right sternomastoid muscle group range from about 25 to 75 msec, with the overall average being 50.2 msec; stretch reflex times for the sternomastoid group in

lateral flexion appeared to be shorter than the times obtained in the sagittal plane study; both males and females showed substantial decrease in muscle strength between the 35-44 and 62-74 year groups; appropriate values for lateral static bending stiffness of the neck for small deformations were determined by computer simulation to be between 8 and 16 in-lb/degree; crash simulation obtained results showing that neck muscle contraction lessened hard-tissue injury from excessive lateral flexion (ELF); ELF injury is more likely in older people due to muscle weakness and slow reflexes; and there was evidence of possible muscle tissue damage of contracted muscle, especially at higher impact speeds.

by R. G. Snyder; D. B. Chaffin; L. W. Schneider; D. R. Foust; B. M. Bowman; T. A. Abdelnour; J. K. Baum
University of Michigan, Hwy. Safety Res. Inst., Ann Arbor, Mich. 48105
Grant DRDA-74-342-B1
Rept. No. UM-HSRI-BI-75-4; 1975; 307p 114refs
Prepared for the Insurance Inst. for Hwy. Safety, Washington, D.C.
Availability: Corporate author

HS-016 753

AUTOMATIC EXTRACTION OF HIGHWAY TRAFFIC DATA FROM AERIAL PHOTOGRAPHS. FINAL REPORT

The design of a system for scanning sequences of aerial photographs with a computer-controlled flying-spot scanner and automatically measuring vehicle locations is described. Aside from the flying-spot scanner itself, other scanning devices are covered: TV cameras, image dissector cameras, mechanical scanners, and laser scanners. Among the software requirements for the operation of a computer-controlled scanning system are: an operating and file management system, coordinate mapping routines, image matching programs, and trajectory matching routines. Measurement accuracy is predicted to be comparable to that achieved with manual methods in high-volume applications. The cost of such a system is estimated to exceed \$500,000. Efficient operation is shown to be critically dependent on the development of an algorithm for predicting vehicle positions that is significantly better than that now available.

by J. G. Raudseps
Dept. of Transportation, Transportation Systems Center,
Kendall Square, Cambridge, Mass. 02142
Grant HW405/R4205
Rept. No. DOT-TSC-FHWA-75-1; 1975; 77p 2refs
Availability: NTIS

HS-016 754

SEAT BELTS: IS FREEDOM OF CHOICE WORTH 800 DEATHS A YEAR?

The effectiveness of seat belts in the reduction of auto deaths and injuries, and the need for compulsory usage legislation in Canada are emphasized. Comparison of causes of death in Canada shows a high significance of auto fatalities over coronary heart disease, respiratory disease, lung cancer and suicide for people under age 70. Fatality figures for 1970 are given for Canada, the United States, the United Kingdom and France. The results of Swedish seat belt research are presented which show a 70% risk of death reduction in collisions under 60 mph with seat belts. Arguments against seat belt usage are also

discussed, along with a description of the seat belt's injury pattern ("seat belt syndrome"). Less successful attempts by the United States and the United Kingdom to increase seat belt usage solely through education are compared with highly successful compulsory seat belt usage legislation in Australia and New Zealand. It is estimated that compulsory seat belt use legislation in Canada would cut fatalities by 50%.

by D. J. Hauser
Publ: CMA Journal v110 p1418-22, 1426 (Jun 1974)
1974; 16refs
French summary.
Availability: Personal author, Rm 1174, Long Range Planning, Brooke Claxton Bldg., Ottawa KIA OK9, Canada; See publication

HS-016 755

ON THE USE OF A COMPUTER CONTROLLED ENGINE DYNAMOMETER FOR THE DEVELOPMENT OF AUTOMOTIVE ELECTRONICS

A computer controlled engine dynamometer has proven to be an effective tool for the development of automotive power-plant control electronics. The computer system consists of minicomputer, a large process control computer, and a scientific data processing computer. The minicomputer, which has real-time control and data acquisition capabilities is the critical component. It controls the engine and dynamometer to duplicate in-vehicle performance and simulates proposed electronic systems. This allows functions and parameters to be specified with all the flexibility of a computer program and minimizes the need to build up preliminary hardware prototypes. Results of an exhaust emission correlation study show that data from this facility duplicates that obtained from U.S. Federal vehicular test procedures on a chassis dynamometer. A second study, concerned with stoichiometric control of air-fuel ratio, demonstrates the capability of the minicomputer to duplicate the behavior of prototype electronic hardware. The ability to analyze the transient behavior of a system with a large number of variables and to focus on a few variables suitable for closed loop control is highlighted in a third study.

by J. F. Cassidy, Jr.
General Motors Corp., Res. Labs., Warren, Mich.
Rept. No. GMR-1425; 1973; 40p 7refs
Prepared for presentation before the Second International Symposium on Automation of Engine and Emission Testing, London, England, 28 Sep 1975 and published in the Conference Proceedings.
Availability: Corporate author

HS-016 756

A COMPUTER-CONTROLLED ENGINE TEST CELL FOR ENGINEERING EXPERIMENTS

A computer-controlled engine test cell was developed for conducting complex experiments with automotive engines. The test cell used a minicomputer to perform data acquisition and closed-loop control of the engine and dynamometer. A table-driven real-time control program was used to duplicate the effects of vehicle, transmission, and road on engine operation. Reference data and acquired data were exchanged over a high-speed communications channel between the minicomputer and a centralized data acquisition computer system. Data can be plotted against time or cross-plotted against other parameters on a graphic cathode-ray-tube display peripheral to the

change parameters during the running of an experiment.
by J. H. Rillings; W. D. Creps; L. S. Vora
Publ: Proceedings of the IEEE v61 n11 p1622-6 (Nov 1973)
1973; 2refs
Availability: See publication

HS-016 757

UNREPAIRED CRASH DAMAGE --IMPLICATIONS FOR COST-BENEFIT ANALYSES

A major difficulty in performing cost-benefit analyses of bumper designs is the fact that much of the damage from low speed crashes is never reported either to public agencies or insurers. Much of this unreported crash damage remains unreported, at least for some time after the crash, and thus surveys of unreported crash damage can provide one source of data for some of the unreported crash damage. During the summer of 1974, surveys of unreported crash damage were conducted in seven metropolitan areas. The results of these surveys are presented. It is concluded that the present state of knowledge on the frequency and amount of unreported crash damage is too limited to enable this essential component to be adequately incorporated into cost-benefit analysis of bumper designs.

by J. Casassa; B. O'Neill; S. Stone; W. W. Sorenson
State Farm Mutual Automobile Insurance Co.; Insurance Inst.
for Hwy. Safety; Arthur D. Little, Inc.
Rept. No. SAE-750009; 1975; 14p 8refs
Presented at the Automotive Engineering Congress and
Exposition at Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 758

INCIDENT DETECTION ON URBAN FREEWAYS

Occurrence of an accident or other lane blockage incident on a freeway reduces the capacity of that section of freeway significantly below normal. Freeway incidents occur randomly, are unpredictable, and result in what is termed nonrecurrent congestion. Thus automatic detection of incidents is a very important function of a corridor surveillance, control, and information system. The development, testing, and evaluation of automatic incident-detection algorithms for urban freeways is discussed. The emphasis is directed toward incident detection during medium- and heavy-flow traffic conditions. An automatic incident-detection model using the standard normal deviate (SND) of the control variable (energy or lane occupancy) was proposed, developed and evaluated. Two strategies were tested, using a 3- and 5-minute data base for each control variable. Strategy A requires one SND value to be critical; strategy B requires two successive SND values to be critical. Strategy B, using lane occupancy with a 5-minute time base, produced the best results. Based on a limited sample size, the study indicated that the SND model was as effective as the composite model, which was considered to be the best existing model. Because the SND model does not require separate distribution curves for various traffic conditions, it may be a more attractive model for an operational system. Relationships were developed and presented that identify sensor spacing

model.
by C. L. Dudek; C. J. Messer; N. B. Nuckles
Publ: Transportation Research Record n495 p12-24 (1974)
1974; 9refs
Sponsored by the Com. on Freeway Operations.
Availability: See publication

HS-016 759

THE TECHNIQUE OF FRONT-WHEEL-DRIVE IN EUROPE

During the past two decades, front-wheel-drive architecture has grown enormously in Europe. This trend in vehicle design can be explained by the need to provide compactness, large inside space, and good road holding. Technical problems that arise when designing a front-wheel-drive car and the various technical solutions in current use are discussed. It is concluded that a preference for front-wheel-drive will last for a long time.

by H. Seznec; H. Lagrange
Regie National des Usines Renault, Center Technique de Rueil
Rept. No. SAE-750013; 1975; 23p
Presented at the Automotive Engineering Congress and
Exposition, Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 760

A FEASIBILITY STUDY OF A REVERSIBLE-LANE FACILITY FOR A DENVER STREET CORRIDOR

The objective of this study is to determine the feasibility of the installation of a reversible-lane facility, to reduce the congestion on a pair of one-way streets during rush hours. It is hypothesized that, based on rush-hour operation within the study corridor, a reversible-lane facility will increase capacity and reduce travel time with a minimum of disruption to the neighborhood.

by J. Hemphill; V. H. Surti
Publ: Transportation Research Record n514 p29-32 (1974)
1974
This is an abridgement. Sponsored by the TRB Com. on
Operational Effects of Geometrics.
Availability: See publication

HS-016 761

TECHNOLOGICAL ASPECTS OF PUBLIC RESPONSIBILITY FOR GRADE [RAILROAD] CROSSING PROTECTION

Recent interest in improvement of safety at railroad grade crossings has been accompanied by a growing involvement of government at all levels. Public responsibility typically has been confined to providing funding, developing information, planning, and regulating; the design, installation, and maintenance of automatic protection has been exclusively a railroad activity. The technical limitations are examined that constrain public authorities from taking total responsibility for crossing protection devices, which are the only highway traffic control devices that are not the responsibility of highway officials. Research directed toward removal of those limitations is

described. A review of the legal history and current role of governmental units precedes a description of conventional technology in terms of impact on a wider public role. Means of train detection and motorist warning are discussed; the conclusion drawn is that the principal technological impediment to non-railroad responsibility for crossing protection is the present dependence on track circuit techniques for the determination of train presence. Analysis of system requirements and available technology has identified a discrete train detector-microwave communication link concept. The results of field testing indicate a number of attractive features and general feasibility.

by J. B. Hopkins

Publ: Transportation Research Record n514 p33-43 (1974)
1974; 8refs

Sponsored by the Com. on Highway-Railroad Grade Crossings.
Availability: See publication

HS-016 762

WHY FRONT-WHEEL DRIVE?

Front wheel drive (FWD) has found acceptance and increased popularity during recent years in medium and medium-small class European cars. A frequent design configuration is the FWD with transverse front engine. The principal factors in this choice are: better use of available space; production costs at levels competitive with other design arrangements; and ease of obtaining derivative models from basic cars.

by P. G. Tronville

Fiat S.p.A.

Rept. No. SAE-750015; 1975; 16p 2refs

Presented at the Automotive Engineering Congress and Exposition, Detroit, Mich., 24-28 Feb 1975.

Availability: SAE

HS-016 763

PAPER POWERPLANTS PROMOTE PERFORMANCE PROGRESS

The evolution and application of a computer program that is primarily intended to be a practical tool to aid in the design and development of small single cylinder, two-stroke cycle, spark-ignition engines is described. Particular attention is directed to the objective of optimizing the relationship between the engine's complex transient flow processes and its basic mechanical simplicity. The aspects of specific output and fuel consumption, as well as those of noise generation and noxious exhaust are considered. A systematic procedure is presented for determining the most practical port and duct dimensions for a new engine application.

by D. S. Sanborn

McCulloch Corp.

Rept. No. SAE-750016; 1975; 16p 27refs

Presented at the Automotive Engineering Congress and Exposition, Detroit, Mich., 24-28 Feb 1975.

Availability: SAE

HS-016 764

TELEDYNE CONTINENTAL MOTORS RED SEAL ENGINES. FIRST CPCS APPLICATION

The new Red Seal Industrial engine line incorporates the controlled pressure combustion system (CPCS) featuring improved emissions control, fuel efficiency, and driveability, without sacrificing maximum power. These new, low maintenance engines are based on time-proven mechanical components with a new cylinder head, carburetor and electronic ignition. The complete research and development history of the program is presented covering the cylinder head, carburetor and ignition system. An automotive program with two cars, matched and optimized to meet the 1975 Light Duty Automotive Standards, without using any exhaust after treatment or other emissions control devices, is described.

by J. F. Requeiro

Teledyne Continental Motors

Rept. No. SAE-750017; 1975; 28p 4refs

Presented at the Automotive Engineering Congress and Exposition, Detroit, Mich., 24-28 Feb 1975.

Availability: SAE

HS-016 765

AN ANALYTICAL EVALUATION OF THE EFFECT OF LEAKAGE ON NO [NITROGEN OXIDES] EMISSIONS FROM A ROTARY ENGINE

A mathematical model describing the Wankel engine combustion process is developed to evaluate the effects of apex-seal leakage on nitrogen oxide (NOX) emissions. It is assumed that leakage occurs only during combustion, specifically: only unburned gas leaks out during compression; and that only burned gas leaks out during expansion. A parametric study is performed to show the effects of such variables as equivalence ratio, compression ratio, and engine speed. An experimentally obtained pressure time trace is used to show the accuracy of the model predictions. It is found that under normal operating conditions, reductions in apex-seal leakage area will not cause an increase in NOX emissions; and that, below 2500rpm, mass leakage drastically increases with further reductions in speed.

by F. D. McCuiston, Jr.

Ford Motor Co.

Rept. No. SAE-750023; 1975; 8p 8refs

Presented at the Automotive Engineering Congress and Exposition, Detroit, Mich., 24-28 Feb 1975.

Availability: SAE

HS-016 766

TIME RESOLVED MEASUREMENTS OF EXHAUST COMPOSITION AND FLOW RATE IN A WANKEL ENGINE

Measurements were made of exhaust histories of the following: unburned hydrocarbons (HC), carbon monoxide, carbon dioxide, oxygen, and nitrogen oxides (NOX). The measurements show that the exhaust flow can be divided into two distinct phases: a leading gas, low in HC and high in NOX, followed by a trailing gas high in HC and low in NOX. Calculations of time resolved equivalence ratios throughout the exhaust process show no evidence of a stratified combustion. The exhaust mass flow rate is time resolved by forcing flow to

The results with the quasi-steady assumption are shown to be consistent with the measurements. Predictions are made of time resolved mass flow rates which compare favorably to the experimental data base. The composition and flow histories provide sufficient information to calculate the time resolved flow rates of the individual gases measured. The information so generated shows most of the NOX is exhausted with the leading gas while most of the HC is exhausted with the trailing gas.

by C. R. Ferguson; G. A. Danieli; J. B. Heywood; J. C. Keek
Massachusetts Inst. of Tech.
Rept. No. SAE-750024; 1975; 16p 22refs
Presented at the Automotive Engineering Congress and
Exposition, Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 767

MEASUREMENT AND ANALYSIS OF ENGINE PRESSURE DATA

A user oriented description is provided of techniques for the measurement and analysis of engine cylinder pressures. These techniques were developed for piezoelectric transducers and for digital systems of data acquisition and analysis. Test cell procedures are described for transducer preparation and calibration, and for association of each pressure with its appropriate crank angle. Techniques are also described for evaluating the accuracy of pressure data and for eliminating specific errors. Two examples of uses for pressure data are discussed: the calculation of heat release rate in conventional engines; and the computation of internal flows in divided chamber engines.

by D. R. Lancaster; R. B. Krieger; J. H. Lienesch
Engine Res. Dept., General Motors Res. Labs.
Rept. No. SAE-750026; 1975; 17p 20refs
Presented at the Automotive Engineering Congress and
Exposition, Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 768

FACTORS ASSOCIATED WITH CHILD USE OF AUTOMOBILE RESTRAINING DEVICES: KNOWLEDGE, ATTITUDES, AND PRACTICE

One hundred ninety-eight child-parent pairs were studied for knowledge, attitude, and practice factors associated with the use of automobile restraining devices in children attending a pediatric clinic. A child use index was cross-tabulated with other variables. Children most likely to be using appropriate restraining devices were over 6 months old and had US-born, white, married parents who had at least completed high school, who themselves used seat belts and who indicated a belief in their ability to control what happens to them in life. No associations were found between use and parents' knowledge about age-appropriate methods of child restraint, or the families' accident history. The parents held many false beliefs about the use of seat belts. Pediatricians might improve parents' behavior in properly restraining their children by in-

part of the well child visit.

by C. G. Neumann; A. K. Neumann; M. E. Cockrell; S. Banani
Grant NIH-RR-3
Publ: American Journal of Diseases of Children v128 p469-74
(Oct 1974)
1974; 14refs
Availability: Dept. of Pediatrics, UCLA School of Medicine,
10833 La Conte Ave., Los Angeles, Calif. 90024

HS-016 769

LOSSES IN NIGHTTIME VISIBILITY CAUSED BY TRANSIENT ADAPTATION

Three experiments are described which investigate the transient adaptation effects at lower luminance levels, comparable to those found in nighttime highway lighting conditions. Momentary visibility loss is associated with surfaces having different luminances, or as a result of illumination changes occurring naturally on the visual environment. These experiments were conducted using a target (8 flash-illuminated letters) superimposed upon a changing background. Ten subjects were used in the first two experiments and six in the third. Subjects ranged in age from 18 to 33 years and had a corrected visual acuity of 20/20. Thirty trials constituted the data for each threshold determination. Threshold was defined as that luminance at which the letters were correctly identified 50% of the time. The first experiment involved a preadapting luminance of 0.02fL, which is equivalent to the ambient light of the full moon. Background luminance was then varied from 0.0002 thru 0.002 and 0.2 to 2.0fL. These provided a 1- or 2-log-unit decrease or increase, changes which have been shown to produce visibility loss. In the second experiment, the pre-adaptive level was 0.2fL, which is approximately the luminance provided by headlights on asphalt pavement. The same background variation was used. As a result of these experiments, it was found that with a low pre-adapting luminance level, sudden increases in the level produced greater visibility losses than sudden level decreases. The results also showed that at low luminance levels a value of Phi depends more upon the ratio of steady-state threshold than upon the ratio of luminance change. Individual differences of visibility loss by the subjects were found to be great. Also, the size of the target had no effect on the degree of visibility loss as measured by Phi, but smaller targets did require higher luminance to be recognized.

by E. J. Rinalducci; A. N. Beare
Publ: Journal of IES p336-45 (Jul 1974)
1974; 12refs
Availability: See publication

HS-016 770

VEHICLE SAFETY AND OCCUPANT PROTECTION. SUBMISSION TO THE HOUSE OF REPRESENTATIVES SELECT COMMITTEE ON ROAD SAFETY, SEPTEMBER, 1974

Various aspects of occupant restraint systems (along with the effects of compulsory seat belt usage), and vehicle design for accident avoidance and crashworthiness are examined. In addition to adult restraint systems, child protection and child restraint systems, such as the seat-and-harness are discussed.

In regard to vehicle design for crash protection, fire-accompanied accidents and causes, vehicle compatibility, windshield characteristics, and car-pedestrian accidents, and injury causes are explored. The importance of recognizing related human and environmental factors also is stressed. Similarly, policy issues in vehicle safety design should be taken into account, as regards competing demands of the total transportation system, including other aspects of accident/injury reduction policy. It is concluded that the extent to which technological advances in safety and restraint system design can be fed into the consumer-oriented automobile industry via legislation depends not only on the degree of involvement shown by governments, but also by social attitudes to accident/injury reduction and the public's willingness to pay for safety improvements.

Traffic Accident Res. Unit, Dept. of Motor Transport,
N.S.W., Australia
1974; 15p 19refs
Availability: Corporate author

HS-016 771

THE MEANING OF HIGHWAY PURPOSE

Case compilation is presented concerning the legal questions surrounding "antidiversion" provisions that preserve and limit the expenditure of specific funds to a "highway purpose" and includes legal authority relative thereto. This is a review of all relevant case law from the 1920's to date to ascertain if the courts have remained consistent in their interpretation of the "highway purpose" concept. The first group of cases are those which can be identified as involving an expenditure of highway funds for uses and purposes directly related to highway construction, but not for the construction of the actual highway. The cases discussed involve: the distinction between expenditures within a highway system, expenditures for the purchase of right-of-way, expenditures for roadside rests and vista sites, expenditures for salaries and expense of highway personnel, expenditures to construct buildings, and expenditures to purchase machinery, safety equipment, lighting, and other physical structures such as bridges. A few cases have been found where highway funds were used for more indirect or remote highway purposes, such as: expenditures for the purchase of insurance and for advertising. Cases were also covered which deal with the use of funds: to refund bonds; to construct turnpikes; to reimburse individuals; to support other forms of transportation; and for other public purposes. The conclusion is that, with the exception of utility relocation cases (under use of funds to reimburse individuals), the courts have consistently interpreted "highway purpose" in a literal manner, holding same inviolate for use of motor vehicle transportation.

by J. P. Holloway
Publ: RRD n68 (Mar 1975)
1975; 16p refs
Rept. submitted under ongoing National Cooperative Hwy. Res. Prog. (NCHRP) Proj. 20-6. "Right-of-way and Legal Problems Arising Out of Highway Programs".
Availability: TRB

HS-016 772

SPIRAL AUTO JUMP ENTERTAINS MOVIEGOERS, MAY RESULT IN SAFER HIGHWAYS

A computer program which allowed a spiral jump in a James Bond movie to occur successfully is discussed with reference to making highways safer. The computer program, developed by Calspan Corporation, is aimed at the eventual reduction in damage to cars and injuries to motorists that often occur when cars run off the road in single car accidents, a common type of highway mishap. This program is a tool which could improve automobile handling characteristics and associated driver behavior, and analyze the effectiveness of various road-side safety improvements.

Publ: Transportation Research News n58 p10-2 (Spring 1975)
1975
Availability: See publication

HS-016 773

NOW FOR THE STOICHIOMETRIC AIR/FUEL RATIO, CLOSED LOOP, SELF-TUNING, CATALYTIC CONVERTER ENGINE

Substantial increases in fuel economy are possible using existing technology and in a relatively short period of time. Three major categories were studied, which would improve fuel economy: improved lightweight body and chassis, with the use of radial tires; improved engine and transmission matching; and improved engine systems. By reducing body weight and improving the aerodynamic drag coefficient, fuel economy was increased by 9 to 13%. In the case of improved engine and transmission matching, two approaches were examined: a four-speed automatic transmission with a torque converter that locked up after the initial start, and a continuously variable transmission. The former was shown to improve gas economy by 13% and would not affect emissions. The latter would improve economy by 23% but requires construction changes to the engine that might impair emission control. Four improved engine systems were studied: the lean-burn engine concept; the stoichiometric air/fuel ratio engine using closed loop, self-tuning systems and catalytic converters; the stratified charge engine; and the lightweight diesel engine. The data on all the body, chassis, engine, and transmission innovations were then programmed into a computer and synthesized into the best possible combinations. The most promising combinations involved all four engine systems with a four-speed automatic transmission and torque converter lockup. The lean-burn system was the most cost-effective but had drivability and emission problems. The closed loop stoichiometric fuel control engine was good because of the self-cleaning aspect but, because of the unproven reliability of the catalyst, the cost-effectiveness was questioned. The potential fuel economy was greatest with the stratified charge engine, but high repair and maintenance costs make it unfeasible. The diesel engine proved to be the best for fuel economy and cost-effectiveness, the only problem being the development of a low weight engine with acceptable performance.

by F. M. H. Gregory
Publ: Motor Trend v27 n6 p53-6 (Jun 1975)
1975

A review of "A study of Technological Improvements in Automobile Fuel Consumption", by D. A. Hurter, W. D. Lee, N. Cook (Arthur D. Little, Inc.).
Availability: See publication

HS-016 774

HS-016 774

TRANSPORTATION FOR THE HANDICAPPED--AN EQUAL OPPORTUNITY TO TRAVEL

The challenge of providing transportation for the handicapped is discussed with reference to systems, techniques, equipment and government regulations. The Urban Mass Transportation Administration has a program which provides funds for the removal of physical travel barriers and for safety improvements. The proposed regulations on transportation services for the elderly and handicapped require that local transportation improvement plans and programs include an element designed to analyze and meet the transportation requirements of the elderly and handicapped. This includes access and use of facilities, as well as transit vehicles. Special bus service, both proposed and currently in use, which accommodate both the elderly and handicapped, are described. The need for flexibility of routes and accessibility, as well as specially designed vehicles, is stressed.

by L. L. Mandel
Publ: Metropolitan v71 n3 p14-7 (May-Jun 1975)
1975
Availability: See publication

HS-016 775

AUTOMOTIVE DESIGN TRENDS

Real innovations in body and suspension design are described as unlikely with the lack of expansion now expected in the auto industry. Since every effort will be made to cut costs however, body structures may become slightly lighter and simpler. Volkswagen Golf and Audi 50 are cited as best indicating future trends, with Ford Escort and Fiat 131 important in detail. The Golf best demonstrates how the combination of front-wheel-drive and attention to detail design can result in much weight saving, one of the most important factors influencing fuel consumption. Structurally, Fiat 131, Citroen CX, and TR7 indicate developments in design. Fiat 131 and Austin-Morris 18-22 show advances in anti-corrosion treatment. In aerodynamics, Citroen, Lotus, and Porsche lead, for this aspect of body design has a significant effect on fuel consumption and wind noise. Five recent models are equipped with McPherson strut suspension: the Escort, 131, TR7, Golf, and Volvo. These innovations shall increase efficiency, lower cost, and failures.

by J. Hartley
Publ: Engineering Materials and Design v19 n4 p15-8 (Apr 1975)
1975
Availability: See publication

HS-016 776

TRI-LEVEL ACCIDENT INVESTIGATION STUDY. PROGRESS REPORT FOR QUARTER NO. 1, 1 JANUARY 1975 TO 31 MARCH 1975

Calspan Corp. is conducting an accident study in an eight county area of Western New York. The objectives are to collect detailed accident data on a random sample of all police reported accidents and to incorporate all available accident data into an accident matrix schedule. Additional data is collected and incorporated on specific vehicle tow-away accidents.

HS-175-11

Along with the quarterly schedule, this report also includes details of a presentation comparing injuries to male and female drivers in frontal impact collisions in relation to location and severity of injuries, with and without the use of safety restraints. The report also includes the presentation of a device and technique for standardizing before and after measurements in crush tests. This is a Multidisciplinary Accident Investigation (MDAI) team project.

Calspan Corp., Buffalo, N.Y. 14221
Contract DOT-HS-053-3-609; CAL-7505-C4.11
1975 ; 17p
Prepared for NHTSA and the Motor Vehicle Manufacturers Association, Inc. (the latter under Calspan contract CAL-7505-C4.11).
Availability: NHTSA

HS-016 777

CORVETTE PLASTIC PROGRESS ENTERS THIRD DECADE

The more than 20-year history of fiberglass reinforced plastic (FRP) as the primary body material for the Chevrolet Corvette is traced. Reasons for the original decision to use FRP are reviewed, followed by a discussion of the difficulties encountered in design, manufacturing techniques, and material compounding. These problems, and the solutions to them, include the progression from the original wet-mat material to low-profile systems. Criteria for selecting structural adhesives for fiberglass-to-steel bonds are covered. Sheet molded compounds are discussed in non-low profile and low-profile applications. Unresolved production problems are outlined with a review of industry attention necessary to assure continued FRP application to Corvette body panels. The design and application of flexible facias used on both front and rear bumper systems and the use of plastic as a bumper energy-managing system are also discussed.

by R. A. Vogelei
General Motors Corp., Chevrolet Motor Div.
Rept. No. SAE-740979 ; 1974 ; 24p
Presented at SAE Automotive Engineering Meeting, Toronto, Canada, 21-25 Oct 1974.
Availability: SAE

HS-016 778

SOME COST BENEFIT CONSIDERATIONS OF CAR OCCUPANT RESTRAINT SYSTEMS

An analysis is given of the effectiveness of various car occupant restraint systems currently being developed in Europe and elsewhere together with estimates of their costs. The analysis is based on the situation in Britain where three point belts have been fitted since 1967, with retrofit to 1965 cars. Thus some 90% of all cars have three point systems fitted to the front seats. Seat belts have therefore been available for some years. A considerable propaganda effort to encourage their use has been conducted by the British Government, and surveys suggest usage rates of 15% in towns, 25% in rural areas and 50% on highways. This situation is markedly different from most other countries in Europe (except Sweden) where the installation of belts in some cases is not yet mandatory. A table is presented comparing usage (front and rear), reliability of operation, effectiveness in reducing injury, performance factors, financial savings per car life, system cost per car, and cost/benefit ratios between the various occupant restraint

systems. Systems compared are: normal three point belt in front; normal three point belt front and rear; normal three point belt on all seats plus load limiter; normal three point belt on all seats plus preloader; inertial three point belt on all seats; inertial three point belt plus light and buzzer; inertial three point belt plus interlock; passive three point belt in front and active three point belt in rear; passive three point belt front and rear; airbags in front and active three point belt in rear; airbags front and rear; and mandatory use of three point belt front and rear. The systems which came closest to being cost effective are three point belt systems with warning or interlock devices.

by G. M. Mackay

Publ: Technical Aspects of Road Safety v59 p4.1-4.11 (Sep 1974)

1974 ; 21refs

Availability: See publication

HS-016 779

EMISSION CONTROLS: WHAT IS THE FUTURE OF THE INTERNAL COMBUSTION ENGINE?

The controversy between automakers and the Environmental Protection Agency (EPA) is discussed, with both sides criticized. The authors state that the automakers tend to put off research and development in the area of emission control, while the EPA has not done enough research to back up its strict emission standards. The failure of the catalytic converter may be a direct result of these weaknesses. The stratified-charge engine is suggested as the most promising solution to the emission control versus fuel economy problem. Also, the relation between emission controls and motor vehicle inspections, air pollution and public health, economy and small cars is explored. The long-term future of the internal combustion engine is held to be uncertain because of the possible future cost and scarcity of petroleum.

by D. Serrill; G. K. Douthwaite

Publ: Trend in Engineering v27 n2 p22-8 (Apr 1975)

1975 ; 8refs

Availability: See publication

HS-016 780

BATTERIES: PROSPECTS FOR ELECTRIC VEHICLES

The major drawback cited, to widespread application of electric vehicles, is the need for improved batteries. It is stated that, while an ideal battery (one with high specific power and high specific energy, long cycle life and 100% utilization of materials) cannot be made, hybrid battery systems may optimize electric vehicle performance. Since lead-acid batteries are available for near-term application to electric propulsion systems, these are discussed first; a comparison of other candidate batteries with lead-acid follows. These batteries are nickel-cadmium, nickel-iron, nickel-zinc, silver-zinc, zinc-chlorine, zinc-air, sodium-sulfur, and lithium-sulfur. It is concluded that hybrid electric vehicles are better able to meet the specifications laid down for the various categories of electric vehicle envisaged. The hybrid solution to the propulsion requirements, with one energy source designed for low rate

applications, the other for high rate applications, gives a much greater choice of battery systems for electric vehicles.

by E. W. Brooman; J. E. Clifford; D. E. Semones

Publ: Automotive Engineering v83 n1 p30-5 (Jan 1975)

1975

Availability: See publication

HS-016 781

NEW PARKING BRAKE MAKES REAR DISC BRAKES PRACTICAL

The technical aspects of rear disc parking brake development are presented. Two types of incremental adjusters are covered: the screw-type "one shot" and the exponential-incremental. Their advantages and disadvantages are weighed and it is found that the exponential-incremental type is better suited to parking brake modification. The ball and ramp technique for parking brake actuation is described. The use of solid disc rotors versus vented rotors was explored and it was found that the vented rotors were preferable for heavy cars. The mechanical operation of rear disc brakes is described and compared with the operation of front disc brakes. Finally, the interaction of the parking brake and the rear disc brake is described.

by C. E. Ballard; R. W. Emmons; F. L. Janosi; K. Goering

Publ: Automotive Engineering v83 n1 p36-9 (Jan 1975)

1975

Based on SAE-741064, "A Rear Disc Brake for American Passenger Cars".

Availability: SAE

HS-016 782

ELECTRONICS AND THE AUTO: THE ODD COUPLE

Regulations have created needs and forced the introduction of automotive electronic systems, but successful implementation of these systems has depended upon the availability of components which will meet both performance and price specifications. Automotive electronic system applications include safety, engine control, instrumentation, power distribution, convenience, and entertainment. Highest projected growth for automotive electronics will occur in the non-entertainment area. Within this category, the integrated circuit (IC) category is most significant, because the IC is the key component that triggers overall growth in automotive electronics applications. Linear versus digital, bipolar versus metallic-oxide semiconductors, and hybrid electronics are also discussed. The use of electronics in anti-collision radar, diagnostic units, and on-board computer controllers during the 1980's is projected.

by R. Staley

Publ: Automotive Engineering v83 n1 p40-3, 62 (Jan 1975)

1975

Availability: See publication

HS-016 783

DIESEL ENGINE DESIGN TRENDS [TRUCK]

The demands of environmental legislation concerning noise and exhaust emissions, together with a greater emphasis on fuel economy, will shape the diesel engine's future design. Future engines will evolve from the best current practice, as un-

from catalyst cars decreased with decreasing fuel sulfur content.

conventional solutions are unlikely. Though severe exhaust emission legislation may favor indirect injection, the superior fuel economy and lower thermal loading of the classic direct injection engine will make it remain the popular choice for further designs. The trend toward increasing vehicle weight is largely due to the economy of operation which can be achieved by large vehicles of 35 tons or more. There are demands to increase the weight limit in states to 40 tons or more because this would permit a 30 ton ISO container to be carried. To assure adequate performance, legislation has been introduced in many countries establishing minimum power-to-weight ratios of vehicles. During the next few years the legislative requirements governing diesel exhaust smoke are expected to become tighter, in respect to both actual smoke emitted and maintenance of low smoke levels over a prolonged period. By 1980, if not earlier, smoke exhaust under steady-state conditions will have to be invisible to the naked eye with a maximum of 5-10% opacity over the entire operating speed range of the engine. Some improvement in engine noise levels may come from better control of diesel combustion, but the more important reductions in noise are likely to come from engine structural modifications. Additional reductions can be achieved by total enclosure of the power plant in an acoustically inert box. It is anticipated that present regulations controlling exhaust emission of hydrocarbons, nitrogen oxides and carbon monoxide will become more severe by 1978. As most direct injection engines cannot meet the 1976 emission levels, indirect injection engines, which can be developed to meet them, become more viable.

by H. W. Barnes-Moss

Publ: Automotive Engineering v83 n1 p44-7, 63 (Jan 1975)
1975

Based on SAE 741130, "Engine Design for the Future," presented at the Truck Meeting, Troy, Mich., 4-7 Nov, 1974. Availability: See publication

HS-016 784

SULFUR EMISSIONS NOT A SERIOUS PROBLEM

Sulfate emissions from 19 cars with catalytic converters, 4 noncatalyst and one diesel passenger car were measured with 1972 Federal Test Procedure (FTP). Some vehicles were also tested with the 1975 FTP, and at 30, 40 and 60 mph. Sulfate emissions were measured as the cars were driven on an electric chassis dynamometer. The entire exhaust was transferred via a stainless steel tailpipe extension to a large dynamic dilution tube, where it was mixed with prefiltered air. A study of the exhaust sulfate and sulfur burned by the test cars under a variety of driving conditions yielded the following conclusions: the small amount of sulfur dioxide (SO₂) in the exhaust gas that is oxidized to sulfate by catalytic converters appears to be no cause for concern; catalysts, which promote the oxidation of hydrocarbons and carbon monoxide in exhaust gas, also oxidize some SO₂ formed in the engine to sulfur trioxide (SO₃) which combines with water to form sulfuric acid (sulfate) aerosol; sulfate emission is highly variable and strongly influenced by SO₂ being stored in and released from the catalyst; sulfate emissions for the catalyst cars were 50% greater on the 1975 FTP than on the 1972 FTP; conversions of fuel to sulfate in prolonged operation at 30, 40 and 60 mph were 50%, 55%, and 30% respectively; use of an air injection reactor system increases sulfate emissions in FTP operation; low sulfate conversion in FTP operation with catalyst promote the release of SO₂ rather than SO₃; and sulfate emissions

by C. R. Begeman; M. W. Jackson; G. J. Nebel
Publ: Automotive Engineering v83 n1 p48-50 (Jan 1975)
1975

Based on SAE 741060 "Sulfate Emissions from Catalyst-Equipped Automobiles" presented at SAE International Automotive Engineering and Manufacturing Meeting, Toronto, Canada, 22-24 Oct 1974. Availability: See publication

HS-016 785

MOTOR VEHICLE ACCIDENTS: HUMAN CAUSES AND INJURIES SUSTAINED. AN IN-DEPTH STUDY OF 35 [ALCOHOL RELATED] ACCIDENTS

Although most automobile accidents were the result of a combination of causes involving the vehicle, the environment and human factors, the most commonly found cause in 35 instances involving 96 people was driver error due, at least in part, to the influence of alcohol and other drugs. Injuries were caused by impact of the victim's body with rigid, non-deforming objects either intra- or extra-vehicular. Safety features are reducing injuries in newer vehicles. Restraint use could have further reduced injuries to 42 of 74 automobile occupants. Unfortunately, restraints were worn by only 23% of the people to whom they were available. Recognition of serious intrathoracic and intra-abdominal injuries by the primary physician and appropriate care has saved the lives of several of the injured individuals. In several ways physicians will make contributions to the reduction of motor vehicle related injuries and death: through the recognition and treatment of the drinking-problem driver; by reporting the drinking-problem driver to the state regulatory agencies when legally authorized to do so; by helping bring about improvement in the evaluation and treatment of the injured; and by supporting highway safety legislation.

by D. A. Nagel; J. R. Priest; D. S. Burton

Publ: Clinical Orthopaedics and Related Research n92 p239-50
(May 1973)

1973 ; 19retr
Supported by the NHTSA.
Availability: See publication

HS-016 786

COMPILATION OF STATE LAWS AFFECTING PRIVACY AND PERSONAL INFORMATION

A source list to state laws affecting privacy and personal information which includes information concerning the following subjects: medical records, wiretapping, school records, polygraphing, arrest records, criminal justice information systems, social security number, tax records, credit reporting and investigation, regulation of state and local databanks, and confidentiality of bank records.

Publ: Privacy Journal (Jan 1975)

1975 ; 12p
Availability: Privacy Journal, P.O. Box 8844, Washington, D.C. 20003

HS-016 787

INTRODUCING A NEW GENERATION OF MORE DETAILED AND INFORMATIVE COMBUSTION MODELS [INTERNAL COMBUSTION ENGINE]

The problems of modeling combustion within internal combustion engines is considered. A method is explained to evaluate the comprehensiveness, detail and predicting capability of a model i.e. considering the equations for the most comprehensive and detailed model and making successively more restrictive assumptions, thus getting progressively less detailed models. Particular attention is paid to the reasons for the assumptions; how they influence the accuracy of a model; and what basic information is missing. In so doing the most detailed of the available models, and their predictive capabilities and limitations, are introduced. They include models for reciprocating and rotary engines with uniform and stratified charges, from dual carburetion and direct fuel injection. One of the models has been available since 1971, and another one is currently and fruitfully employed to aid the development of a production engine. Also introduced are more advanced models presently under development and their applications. The equations of the most common and least detailed models are derived from the most general equations, thus evidencing their inherent limitations.

by F. V. Bracco
Guggenheim Labs., Princeton Univ., Princeton, N.J.
Grant NSF-GI-44232
Rept. No. SAE-741174 ; 1974 ; 24p 48refs
Presented at International Stratified Charge Engine
Conference, Troy, Mich., 30 Oct-1 Nov 1974.
Availability: SAE

HS-016 788

IMPROVING THE MEASUREMENT OF CHASSIS DYNAMOMETER FUEL ECONOMY

Obtaining vehicle fuel economy data in conjunction with chassis dynamometer emissions testing is a useful and convenient technique. Data derived in this manner, using EPA city and highway driving cycles, are in wide use. Fuel economy results obtained by carbon mass balance calculation of carbon containing compounds in the vehicle exhaust are at least as accurate and repeatable as those obtained by direct measurement of fuel consumed. Nevertheless, the overall chassis dynamometer-carbon balance fuel economy test yields an undesirable variation of results and needs refinement. Major factors influencing the accuracy and repeatability of test results are: carbon dioxide measurement accuracy; variations in following the driving cycle; vehicle-dynamometer interface conditions; associated calibration, calculation, test technique, and procedural methods, and controls employed. Each of these factors is discussed in terms of its relative importance, and causal factors along with suggested or potential means for improvement.

by B. H. Simpson
Ford Motor Co.
Rept. No. SAE-750002 ; 1975 ; 18p 12refs
Paper presented at the Automotive Congress and Exposition,
Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 789

MEASUREMENT OF MOTOR VEHICLE OPERATION PERTINENT TO FUEL ECONOMY

With recent advances in electronic technology it has become both possible and practical to monitor vehicles in public use and to make extensive field data recordings. Field data collected relating to fuel economy testing is described along with descriptions of the data gathering techniques, data gathering instrumentation, the test schedule validation program, definition of terms, data analysis and results. The objective was to select privately operated vehicles in a random manner from across the United States so as to insure that the data recorded would be representative of the cross-section of U.S. drivers. Recordings have been made on more than 80,000 miles of driving. More than 2,500 private automobile drivers (of both domestic and foreign vehicles) have been monitored. The primary bulk of data was gathered by three chase cars, instrumented to record their own operating patterns and environment. These vehicles were used to follow public operated vehicles and emulate their driving and thus record their operating patterns and environment. In addition to chase cars, long duration strip-chart recorders were installed in vehicles in use by the public. These devices recorded speed vs. time, while the vehicles were in motion. Passive electronic recording devices were also installed in selected vehicles, which recorded the portion of miles driven within various speed bands. The data analysis indicated two distinct modes of driving behavior, a highway mode and a non-highway mode. The highway driving is characterized by few stops, high speed and little idling. The non-highway driving is characterized by moderate speeds, moderate stopping frequency and increased idle time.

by T. M. Johnson; D. L. Formenti; R. F. Gray; W. C. Peterson
General Motors Proving Ground Noise and Vibration Lab.
Rept. No. SAE-750003 ; 1975 ; 32p
Presented at the Automotive Engineering Congress and
Exposition, Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 790

PASSENGER CAR FUEL ECONOMY AS INFLUENCED BY TRIP LENGTH

Data from the Nationwide Personal Transportation Study (NPTS) and other sources have been used to generate distributions of vehicle miles traveled (VMT), average speed, and fuel consumption as a function of trip length. Approximately one third of all automobile travel in the United States is seen to consist of trips no more than ten miles in length. Because short trips involve more frequent stops and a smaller percentage of operation during warmed-up conditions, nearly half of the fuel used by automobiles is consumed during the execution of these short trips. The typical trip of approximately ten miles in length has been shown to result in a fuel economy that is equal to the average fuel economy achieved for all trips combined. NPTS data on average speed vs. trip length and General Motors data on stops/mile vs. average cycle speed indicate that the major characteristics of the trip that results in fuel economy equal to the overall fuel economy are an average speed of 24.5 mph and 1.4 stops per mile. The composite of

the Environmental Protection Agency city and highway driving cycles is 26.6 mph and 1.4 stops per mile.

by T. C. Austin; K. H. Hellman
Environmental Protection Agency
Rept. No. SAE-750004; 1975; 16p 11refs
Presented at the Automobile Engineering Congress and
Exposition, Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 791

A STUDY OF TECHNOLOGICAL IMPROVEMENTS IN AUTOMOBILE FUEL CONSUMPTION

Tests were conducted to determine the potential reduction in automotive fuel consumption based on the use of innovative systems and improved components. Technological areas investigated were spark ignited engines, with and without turbocharging; electronic feedback controlled fuel injection with dual bed catalytic converters; stratified charge combustion; light weight diesels; lock-up torque converters; continuously variable ratio transmission; tires; aerodynamic drag; vehicle weight; engine accessories and optional equipment. Standard and compact-size 1973 model year vehicles were selected for analysis using a computer-simulation program to predict fuel usage and performance, with and without incorporation of the improvements. In addition, estimates were made as to whether modified vehicles complied with study constraints such as emission, safety, noise and user requirements. Cost effectiveness, manufacturing adaptability and probable time frame for introduction of improvements were also estimated. The study results indicated that the goal of 43% improvement in fuel economy or 30% reduction in fuel usage of a 1973 model year compact and standard size vehicle could be attained on a mass produced scale by the early 1980s.

by D. A. Hurter; W. D. Lee
Arthur D. Little, Inc.
Rept. No. SAE-750005; 1975; 28p 22refs
Presented at the Automotive Engineering Congress and
Exposition, Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 792

THE DEVELOPMENT OF THE NEW SAE MOTOR VEHICLE FUEL ECONOMY MEASUREMENT PROCEDURES

A new fuel economy test procedure has been developed for passenger cars and light trucks that is similar to the established procedures used by U.S. automobile manufacturers. The new SAE procedure provides a standardized method for use in obtaining and comparing vehicles fuel economy values that relate to average conditions encountered in various modes of driving. The various aspects of the program discussed include: road versus laboratory testing; existing procedures; evaluation, comparison and selection of test cycles; test repeatability amongst facilities; relation of test results to those obtained in actual customer usage; comparison of independent consumer survey results; and correction factor development and application.

SAE Fuel Economy Measurement Procedures Task Force
Rept. No. SAE-750001; 1975; 12p
Presented at the Automotive Engineering Congress and
Exposition, Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 797

ANNUAL TRAFFIC SUMMARY REPORT, 1974 [CITY OF ORLANDO, FLORIDA]

The accident rate in Orlando in 1974 has declined considerably, approaching the 1969 level. The ratio of traffic accidents per thousand vehicles registered is at its lowest level since 1956, the year the study began. The reasons for this decline are assumed to be attributable to increased cost of gasoline, resulting in reduced driving; reduced speed limits; operation of the East/West Expressway; and the constant upgrading of traffic engineering facilities. Several intersections have been reworked by the Traffic Engineering Department with good results, reducing the number of "accident locations" and "high accident intersections". The year 1974 had half the fatalities of 1973 and 12% fewer accidents.

Traffic Engineering Dept., Data Section, Orlando, Fla.
1974; 116p

On cover: Annual Accident Summary Report.
Availability: Corporate author

HS-016 798

CAR-CRASH EXPERIMENT FOR THE UNDERGRADUATE LABORATORY

An interesting, inexpensive, and highly motivating experiment for the undergraduate laboratory has been developed. Uniform and accelerated motion is studied in this experiment by measuring the position of a car as a function of time as it crashes into a rigid wall. The data are obtained from a sequence of picture made by high speed cameras which recorded the actual crash. In addition, the experiment offers practice in scaling and clarifies the concept of significant figures.

by P. L. Ball; G. D. Doolen; E. S. Fry; M. D. Wedin
Publ: American Journal of Physics v42 n8 p645-8 (Aug 1974)
1974; 2refs
Availability: See publication

HS-016 799

NHTSA: PAST ACTION AND FUTURE CHALLENGE

The problems of a regulatory agency are discussed by Dr. James Gregory, Administrator of the National Highway Traffic Safety Administration. Recent motor vehicle safety standards involve complex and costly factors affecting manufacturer and consumer alike. Research procedures for developing better standards and the lack of an anticipated schedule of rule making is criticized by the General Accounting Office. The latest program plan manual is severely outdated.

by D. A. Colburn
Publ: Automotive Industries v152 n10 p13-5 (May 1975)
1975
Availability: See publication

HS-016 800

EMISSION CONTROL AND FUEL ECONOMY

The conventional piston engine will continue to be the dominant automobile power plant. Two major factors to which it must respond are emission standards and fuel economy. These

two areas are closely linked. This is a theoretical study of the relationship between them, using exhaust gas temperature as a correlation parameter. In this way, the fuel economies of a variety of catalytic and thermal control systems have been predicted as a function of emission control level. Factors affecting fuel economy and raw engine emissions can be divided into those external and those internal to the engine. For this study the external factors are assumed constant. The internal factors exerting significant effects are air-fuel ratio, compression ratio, spark timing, load factor, and exhaust gas recycling. Each of these is discussed in terms of engine efficiency and the emission of carbon monoxide, unburned hydrocarbons, and nitrogen oxide. The relationship of exhaust gas temperature and the control of emissions outside the engine is also covered. Because lower exhaust temperatures are the product of increased fuel economy, while high exhaust gas temperature is desirable for the control of emissions outside the engine, types of trade-offs between exhaust gas temperature (fuel economy) and external emission control are considered. Three basic methods for emission control are discussed: thermal reactors, which rely on homogeneous oxidation to control carbon monoxide and hydrocarbons; oxidation catalysts for carbon monoxide and hydrocarbons; and dual catalyst systems, which incorporate in series a reduction catalyst for nitrogen oxide and an oxidation catalyst for carbon monoxide and hydrocarbons. In selecting the best systems for emission control, the largest differential cost factor is normally fuel economy. It is concluded that, for the 1975 U.S. interim standards, the combination of thermal systems and high compression ratios is almost equivalent to the use of catalytic systems at lower compression ratios. However, for higher standards, catalytic converters are better.

by L. E. Furlong; L. S. Bernstein; E. L. Holt

Publ: Chmtech p34-8 (Jan 1975)

1975 : 10 refs

Based on a paper presented at the ACS Los Angeles meeting (Spring 1974) and updated to include Congressional action to stretch out auto emission reductions.

Availability: See publication

HS-016 801

HOW MUCH ENERGY TO PRODUCE REINFORCED PLASTIC PARTS?

The fuel crisis has caused the auto industry to increase its efforts to improve fuel economy of cars and trucks. Since vehicle weight has a great influence on fuel consumption, one of the prime targets in the campaign for better economy is weight reduction. Because of the high strength-to-weight ratio of fiber glass-reinforced plastic, its application in the industry is such that it can produce components weighing 50% less than comparable steel ones. Virtually all automakers employ fiber glass-reinforced plastic products in some form. Cost/performance benefits include: moderate tooling costs; parts consolidation, permitting many parts to be molded into single components; design flexibility, making fuel-saving aerodynamics and styling innovations more economic; dimensional stability and abuse resistance in performance over a wide range of temperature and stress conditions; and chemical resistance to corrosion, lubricants, ozone, hydrocarbons, and various solvents. A realistic analysis was made using an intermediate size car hood made of steel, aluminum, and plastic. The energy consumption rates for processing and manufacturing the various materials were computed. According to this analysis, a 1-piece hood of plastic would represent an energy savings of 5 million Btu when compared to steel, when the production and weight re-

lated gasoline savings for the lifetime of the car were combined.

by E. D. Trueman

Publ: Automotive Engineering v83 n2 p32-4 (Feb 1975)

1975

Based on SAE-750155, "Weight Saving Approaches Through the Use of Fiber Glass-Reinforced Plastic".

Availability: See publication

HS-016 802

ELECTRONIC DISPLAYS ARE COMING

As vehicles become more complex, the amount of information needed to be displayed increases. A typical vehicle in 1970 had two instruments and nine indicators while a vehicle in 1980 is expected to have four instruments and 20 indicators, plus additional service and diagnostic displays. As the industry moves toward smaller more compact vehicles, the human factors, safety and component weight, size, and location problems become more difficult to solve. Four types of electronic displays can help the designer solve these problems: light emitting diodes; gas discharge tubes; liquid crystal display; and electroluminescence. However, large scale usage of electronic displays is unlikely, unless certain problems unique to the automobile environment are solved. These problems have to do with readability of displays due to the reflection of the driver on the panel and the "wash-out" due to sunlight. These problems can be solved through the use of non-reflective materials and light filtering techniques.

by N. Nissley; R. J. Boike

Publ: Automotive Engineering v83 n2 p26-7, 29, 95 (Feb 1975)

1975

Based on SAE Paper 750366 "Electronic Display Applications In Instrument Panel Design".

Availability: See publication

HS-016 803

A LIGHT DUTY DIESEL FOR AMERICA?

Experience with lightweight, high speed diesel engines has shown them to be the most efficient, practical engines produced today, with a volumetric fuel consumption of 20 to 50% less than their gasoline counterparts. The present high cost and scarcity of gasoline may shortly make the diesel a desirable alternative in this country. The engine would have to give the same acceleration and general performances comparable to gasoline cars, while meeting emission standards. The diesel vehicle would have to be acceptable aesthetically, emitting little if any visible smoke and limiting noise and vibration. Finally, the engine should not weigh much more than a comparable unit and should give better fuel economy. It was found that there would be no difficulty, as far as power output and engine size were concerned, as regards conversion to diesel of existing vehicles. Though diesel engines would have no problem complying with hydrocarbon, carbon monoxide, and even nitrogen oxide emission standards (until 1980), they would have problems if standards were placed on particulate matter. It is generally conceded that the indirect injection system of a diesel gives better performance and fuel economy, as well as reducing engine noise. A fairly complicated system of speed and load injection advance is necessary to achieve minimum exhaust emissions without significant loss of performance. Because of the increased cost and size of turbochargers, the lightweight "American" diesel should remain

naturally aspirated. Cold starting could be a problem in some areas of the U.S. Only a rapid-warmup starting aid will solve this problem and give the immediate start of a spark-ignition engine. Though the problem of torque recall would remain, the general drivability would not be inferior and might even be better at low speeds in high gear. Though the initial cost is higher, the operating advantages of greater reliability, lower maintenance costs, and greater fuel economy allow this outlay to be recovered.

by M. L. Monaghan; J. J. McFadden; H. W. Barnes-Moss; W. M. Scott; D. E. Larkinson; B. R. Jewsbury
Publ: Automotive Engineering v83 n2 p21-5 (Feb 1975)
1975

Based on SAE Papers 750330 "A Light Duty Diesel For America"; 750331 "The Light Duty Diesel Engine for Private Transportation"; and 750333 "A Diesel Engine for Light Duty Applications" presented at the SAE Annual Meeting, Detroit, Mich., 24-28 Feb 1975.
Availability: See publication

HS-016 804

SEAT BELT INJURIES: THE NEED FOR ACCURACY IN REPORTING OF CASES

The need for more specific accident data is indicated, especially as regards the evaluation of passenger restraint effectiveness. Recommendations are made detailing the types of information necessary. The following medical data are required: vital statistics; descriptions of all injuries, major and minor; and clinical findings, such as those from operations, X-rays and autopsies. Snugness or looseness of the seat belt, as worn at the time of crash, should also be noted. Data are necessary concerning the vehicle driven: the type of vehicle and restraint system, the location of passengers, and the location of occupant impact points in the vehicle. More detailed information is also needed concerning the accident itself.

by D. F. Huelke; R. G. Snyder
Publ: Journal of Trauma v15 n1 p20-3 (Jan 1975)
1975; 33refs
Availability: Donald F. Huelke, Dept. of Anatomy, 4818 Medical Science 2, Univ. of Michigan, Ann Arbor, Mich. 48104

HS-016 805

AUTOMOBILE ACCIDENT STUDIES OF MAXILLOFACIAL INJURIES

The mechanisms of orofacial injuries vary, depending on the crash configuration: head-on, rollover, side, or angle impact. The area of the car contacted and the force of occupant impact are pertinent factors in the determination of the extent of injury. Examples of injuries from actual accident cases are presented. These cases involved ejection, steering wheel and windshield impacts, as well as impacts to the side window frames, the rear view mirror, the side windshield supports, and even with other occupants. It was concluded that the use of the available lap and shoulder belt would prevent from 10,000 to 15,000 fatalities annually, and would significantly reduce the number of injuries, particularly those to the face.

by D. F. Huelke; H. W. Sherman
Publ: Clinics in Plastic Surgery v2 n1 p53-8 (Jan 1975)
1975; 15refs
Availability: See publication

BELTS, BAGS, AND MEDICINES: APPLICATION OF A MEDICAL TREATMENT AND PREVENTION MODEL FOR AUTOMOBILE OCCUPANT PROTECTION

Based on the premise that restraint systems can be viewed as medicines for the prevention of injury or death, some pharmacological approaches to the occupant restraint discussions are presented. Traffic morbidity and mortality are presented as endemic diseases; and pharmacological countermeasures, in terms of testing dose rates, LD 50, side effects, informed consent, and multiple drug usage, and federal drug approval, are described.

by E. F. Domino; D. F. Huelke
University of Michigan Medical School
Rept. No. SAE-750392; 1975; 6p 3refs
Presented at the Automotive Engineering Congress and Exposition, Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 807

AN APPROACH TO EVALUATE VEHICLE DRIVEABILITY THROUGH ENGINE DYNAMOMETER TESTING

Vehicle surge, which is a low frequency fore and aft oscillation of the vehicle while cruising, is one of the major factors of poor driveability. A method for accurate and objective evaluation of vehicle surge has been developed and is described. Vehicle surge can be evaluated quantitatively by measuring the torque variation observed on the propeller shaft that connects an engine with an engine dynamometer. In order to prevent vehicle surge, mean amplitude of the torque variation should be kept less than 1.2 kg.m on an engine dynamometer under a road-load condition. The influence of emission control techniques, such as exhaust gas recirculation, spark timing retard, and modified configuration of combustion chambers, on both vehicle surge and nitrogen oxide (NOx) emissions, has been investigated through the method described above. The results show how to find the best compromise between emissions and vehicle surge. It was found that cycle-by-cycle fluctuation in maximum cylinder pressure (Pmax), which is considered to indicate fluctuation in engine output, affects the vehicle surge. Extremely low Pmax in Pmax-fluctuations, including misfiring, trigger resonance vibration in the power train of an engine on a dynamometer or in a vehicle. The resonance frequency of the power train is generally in the range of 0-20 Hz, which is the most sensitive frequency for man. The resonance vibration causes fore and aft oscillation of the vehicle. The driver's surge rating is correlated with the "vehicle surge intensity", that is defined as a mean amplitude of vehicle acceleration variation. The quantitative relationship of the driver's surge ratings and the vehicle's and engine's surge intensities was obtained. It was also found that in order to prevent vehicle surge, the mean amplitude of the torque variation should be less than 1.2 kg.m, under road-load conditions at 40km/hr.

by M. Amano; M. Nakada; N. Kobayashi
Toyota Motor Co., Ltd., Engine Engineering Dept., Japan
1974; 40p 6refs
Presented at the Third International Symposium on Automation of Engine and Emission Testing, 25-27 Sep 1974.
Availability: Corporate author

HOW MUCH SAFER ARE YOU IN A LARGE CAR?

A file containing 16,003 accidents reported by police departments in Texas in 1972 was used. This represented a regular sample of 5% of all accidents between "large" and "small" cars. The dichotomous vehicle size (i.e., large/small) was the dependent variable. Predictor variables were: vehicle damage area, damage extent, driver age, driver sex, and driver injury severity. The conclusion was that small cars produce a higher probability of a fatality, in a given collision, than do large cars. Small cars are disproportionately more lethal to older drivers than are large cars, evidently due to the older drivers' sensitivity to injury, since older drivers are involved in somewhat less severe crashes (from a crash dynamics point of view). The predominant increase in injury with age is in fractures in the thorax region.

by J. O'Day; R. Kaplan

Publ: HIT Lab Reports v5 n9 p1-10 (May 1975)

1975; 12p 3refs

Availability: Head, Systems Analysis, HSRI, Huron Parkway and Baxter Road, Ann Arbor, Mich. 48105

HS-016 809

HIGHWAY VEHICLE SPEEDS. SPECIAL REPORT, 1973-1974

In order to assess the degree of compliance and the effectiveness of enforcement of the reduced speed limit, this analysis was made of 1973 and 1974 speed information submitted by State highway departments. These data are based on radar observations of free-flow speeds collected annually at selected locations in a number of states. The speeds are collected on level, straight sections of main rural roads and on urban streets during off-peak periods of the day, where drivers can travel at their desired speed. The speeds of over 600,000 vehicles were recorded. The major findings were that the average speed of all vehicles during the spring and summer months on main roads decreased from 60.3 to 54.8. The average speed in eastern states was 53.0 mph and 55.5 mph in the central and western states. Highway systems which had relatively high posted speed limits in 1973 reflected the greatest change, as evidenced by the decrease on the Interstate System from 65.0 to 57.0 mph. Average passenger car and bus speeds showed a greater decrease than truck speeds. A measure of the level of compliance is reflected in the percentage of vehicles exceeding 55, 60 and 65 mph in 1974, as opposed to 1973. In 1974, 47% of all vehicles exceeded 55 mph as opposed to 70% in 1973. In 1974, only 17% exceeded 60 mph compared to 50% in 1973. Only 5% exceeded 65 mph in 1974 compared with 31% in 1973. The speed range of 51 to 65 mph accounted for 71% of free-flow vehicles in 1974, as compared to 53% in 1973.

by H. Bishop; J. Page; F. Jarema; D. B. Breedon
Federal Hwy. Administration, Office of Hwy. Planning,
National Hwy. Traffic Safety Administration, Office of Res.
and Devel.

1974; 58p

Availability: NHTSA

HS-016 810

DER AUTOMATISCHE HYDROSTATISCHE FAHRANTRIEB DES SYSTEMFAHRZEUGS DEUTZ

HYDROSTATIC TRANSMISSION OF THE OFF THE ROAD SYSTEM VEHICLE DEUTZ INTRAC (206)

A new system vehicle was equipped with an automatically controlled hydrostatic transmission to increase its efficiency and the comfort of its driver. The transmission control is a hydraulic system which automatically varies the speed ratio of the hydrostatic units according to the position of a speed lever and to engine speed. Thus the correlation between vehicle speed and engine speed can be altered rather freely within the vehicle's speed range, to properly suit the given conditions of implement operation. Driving on the road offers the comfort of a passenger car with automatic transmission. The combined performance requirements of the drive train and power-take-offs (pto) may overload the engine creating an unwanted drop in engine speed. This is prevented by an automatic load governor, which gives priority to the pto's and is also used to improve the vehicle's acceleration and inching behavior. The technique of the DEUTZ INTRAC system vehicles is briefly described, together with a glance into their farm and industrial applications.

by B. Breuer

Publ: ATZ v77 n4 p106-10 (Apr 1975)

1975; 15refs

Includes English summary.

Availability: See publication

HS-016 811

ZUR PROBLEMATIK DER FAHRDYNAMIK IM GRENZBEREICH (VEHICLE LATERAL DYNAMICS UNDER EXTREME CONDITIONS)

From the time McHenry published his theoretical model of a vehicle to simulate single vehicle accidents, the question has not yet been answered as to the degree to which vehicle reactions to rapid excitations can be realistically predicted. This paper is motivated by the experience that the cause for an agreement of simulated and experimental results could very well be the lack of exact data or adequate modeling assumptions. A method is described for combining experiment and simulation to get agreement of higher order and to extend the knowledge of tire behavior under extreme slip angle and load conditions. In connection with a general purpose simulation model, this is the basis for a reliable prediction of vehicle reactions up to the limits of road holding, cornering ability, and even roll over. Tire tracks of a vehicle reacting to a drastic steering wheel input on a flat surface allows an accurate reproduction of the movement in detail, such as the time history of yaw angle, lateral deviation, slip angles (even exceeding 90°), and wheel bouncing. The unexpectedly high sensitivity of the results to small variations of input data gives the possibility of tuning the unknown areas of tire carpet plots up to extreme values of the slip angle and load, which are characteristic for vehicle pre-accident dynamics. The achieved measure of congruence marks the starting point for technical applications and a better understanding of influencing parameters.

by U. Sorgatz; F. Ammesdorfer

Publ: ATZ v77 n4 p124-9 (Apr 1975)

1975; 4refs

Includes English summary.

Availability: See publication

**BRITISH COLUMBIA DEPARTMENT OF
TRANSPORT AND COMMUNICATIONS. ANNUAL
REPORT, JANUARY 1, 1973-MARCH 31, 1974**

The Province of British Columbia's statistics are provided on the following: aircraft services; transportation related construction and engineering; commercial and private motor vehicle operation; transportation planning and research; local and coastal ferry operation. It also reports on telecommunications services, communication system development and regulation, and computer and consulting services.

Province of British Columbia, Dept. of Transport and Communication, Victoria, B. C., Canada
1973 : 67p
Availability: Corporate author

HS-016 813

**HASTIGHETBEGRANSNINGARS EFFEKT PA
TRAFIKOLYCKOR [EFFECTS OF SPEED LIMIT
REDUCTIONS ON TRAFFIC ACCIDENTS]**

Comparisons were drawn between the speed limits of 130 and 110 km/h on highways and 90 and 110 km/h on two-lane roads. The aim of the study was to broaden the information base which is available for decisions concerning suitable speed limits in different road and traffic environments, as regards the rural road network. The study comprised one before- and one after-period (referring to the change to right-hand traffic) during which the accidents for the roads in question was studied. At the same time, comparisons of the accidents for similar roads for which speed limits remained unchanged were made for corresponding periods. In addition to information about accidents, it was also possible to obtain traffic and road data. The highways included in the study have a total length of 271 km and consist of 55 separate stretches of road. The speed limit on highways was 130 km/h during the period Sep. 2, 1968 to Apr. 4, 1970 and 110 km/h after this period. A comparison between the number of police-reported road accidents during the period Sep. 2, 1968 to Apr. 4, 1970 and during the period Sep. 1, 1970 to Apr. 4, 1972 showed that the number of accidents decreased by 16%. The reduction was the same for both personal injury accidents and accidents involving only property damage. The accidents were also tabulated separately in the interchange areas and between the interchanges. No differences in the accident rate was found. The reduction of single-vehicle accidents and multi-vehicle accidents was also about the same and amounted to between 15 and 20%. The two-lane roads in the study had a total length of 3000 km. The investigated periods were from Jun. 1, 1970 to May 31, 1971 and from Jun. 1, 1971 to May 31, 1972. During the first period the speed limit was 90 km/h and during the latter period 110 km/h. On lightly traveled roads, accidents increased by 10% with the higher speed limit. On more heavily traveled roads, the number of accidents rose by 50%.

by B. Andersson; G. Nilsson
National Swedish Road and Traffic Res. Inst., Stockholm, Sweden
1974 : 57p 6refs
Text in Swedish with English summary.
Availability: Corporate author

FROST ACTION ON ROADS

The most apparent effects of frost action on roads are frost heave and reduced load capacity during the spring thaw period, often resulting in damage to the pavement, and lower permissible axle loads. Repair work on the pavement, the unevenness of the surface and, in some cases, the possible risk of icy surface conditions will disturb traffic flow, and affect traffic safety and road user costs. Appropriate pavement design and construction practices, with regard to frost action, are of importance for the overall costs, i.e. for the construction, maintenance, and operation of roads. This proceedings contains summaries of the 54 papers presented; an account of the discussions at each of the five Symposium sessions; and the conclusions and recommendations of this international symposium. During the first session, on climatological factors, the characteristics of the winter climate in certain OECD Member Countries, and the major climatic elements were presented. Theoretical climate models were described, and the need for cooperation between meteorologists and road engineers was highlighted. The second session dealt with the propagation of frost, and the thermal analyses undertaken in some countries. Both theoretical and experimental research was evaluated. The papers and the discussion of the third session, on freezing mechanism and criteria, concentrated on frost susceptibility parameters and tests. It was recommended that use should be made of tests that actually submit the soil to a freezing process; there is, however, a need for easy to apply and simple criteria. The fourth session allowed for a comprehensive review of present pavement design procedures in OECD Member Countries; and the fifth session provided a thorough examination of special, or recently developed, pavement protection methods.

Organisation for Economic Co-operation and Development, 2, rue Andre-Pascal, 75775 PARIS CEDEX 16, France
1974 : 228p refs
Proceedings of the Symposium on Frost Action on Roads held at the Norwegian Road Res. Lab., Oslo, 1-3 Oct 1973. At head of title: Road Research.
Availability: Director of Information, OECD 2, rue Andre-Pascal, 75775 PARIS CEDEX 16, France

HS-016 815

**EUROPEAN RULES CONCERNING ROAD TRAFFIC,
SIGNS AND SIGNALS: VIENNA 1968--GENEVA 1971-
1973**

This co-ordinates the provisions of the Convention on Road Traffic of 1968, the European Agreement supplementing the 1968 Convention on Road Traffic, the Convention on Road Signs and Signals of 1968, the European Agreement supplementing the 1968 Convention on Road Signs and Signals, and the Protocol on Road Markings. Included in the text are legal definitions and obligations of the contracting nations, the "Rules of the Road", and the registration of vehicles and drivers. The remainder of the text deals with the use and placement of traffic signs and signals, as well as a description of the authorized signs and markings to be used.

European Conference of Ministers of Transport, OECD, Paris, France
1974 : 180p
Availability: OECD Publications, 2, rue Andre-Pascal, 75775 Paris Cedex 16, France

EUROPEAN EXPERIENCE IN PEDESTRIAN AND BICYCLE FACILITIES

An investigation was undertaken to find out how bicycles were accommodated in European cities, and what special devices are used to control bicycles in the traffic stream. In addition, an investigation of European experience relative to pedestrian facilities and control was undertaken. The following countries were examined: Germany, the Netherlands, Denmark, Sweden, and Great Britain. Bicycle activity in Europe is far more extensive than in the United States. However, the trend of bicycle usage is decreasing in Europe, while increasing in the U.S. Most of the countries visited have plans for extensive bicycle routes and have made provisions for separate bicycle paths. In addition, control of bicycles is more advanced than in the U.S. Bicycle signals were in evidence in almost every city, as were special bicycle markings. Neighborhood redesign, as evident in Delft, Netherlands, was studied in detail. This is a stunning example of the Dutch commitment to environmental changes for pedestrian and bicycle safety. Neighborhoods have been redesigned to prohibit through traffic, to reduce the number of vehicles, and to reduce vehicular speeds by changes in the highway system. In each city visited, it was evident that large areas had been set aside for pedestrian activity. The control of these pedestrian precincts varied from a complete prohibition of vehicle traffic to allowing traffic to proceed slowly. Control of pedestrian traffic was also studied in the context of pedestrian signs, signals, and markings. The use of barriers to direct pedestrian traffic, and of pedestrian overpasses and underpasses to prohibit at-grade crossings was also investigated. Symbolic pedestrian signals and street markings were also in evidence.

by J. A. Fee
Federal Hwy. Administration
1975 ; 35p 1ref
Reprinted from the International Road Federation Annual Report, 1974.
Availability: Corporate author

HS-016 817

HYDROGEN SULFIDE FORMATION OVER AUTOMOTIVE OXIDATION CATALYSTS

A number of laboratory and engine dynamometer studies were conducted to determine the effect of various catalysts and engine operating parameters on the formation of hydrogen sulfide (H₂S) over alumina-supported platinum and palladium catalysts. These experiments were conducted using small catalyst volumes in integral catalytic reactors. Both laboratory bench tests, using simulated exhaust gas feedstreams, and engine-dynamometer tests were conducted. These experiments indicated that H₂S formation occurs at high temperatures under dioxide deficient conditions. The fraction of exhaust gas sulfur dioxide converted to H₂S was relatively constant for various fuel sulfur levels, and thus H₂S formation decreased as fuel sulfur content decreased. Calculation of thermodynamic equilibria, as well as various experimental results, indicated that H₂S formation was kinetically limited under the experimental conditions investigated. Since the operating conditions that favor H₂S formation (high catalyst temperature and dioxide deficiency) do not normally occur in current oxidation catalytic emission control system operation, the formation of

H₂S over automotive oxidation catalysts is unlikely unless engine or system malfunctions occur.

by G. J. Barnes; J. C. Summers
General Motors Res. Labs.
Rept. No. SAE-750093 ; 1975 ; 8p 8refs
Presented at the Automotive Engineering Congress and Exposition, Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 818

COOLING HIGHER HORSEPOWER HIGHWAY DIESEL ENGINES

A field test was conducted using a production cab-over tractor with a KT-450 engine, (which is an in-line 6-cyl engine of 1150 in displacement), to attempt to understand better the interrelationship between higher-horsepower and the installed cooling capability. The motor's maximum automotive application rating is 450 hp at 2100 rpm. The load was provided by a ballasted 40 ft semitrailer. The combination had a gross weight of 73,000 lbs. Twenty-five variables were recorded covering altitude, barometric pressure, operating pressures, operating temperatures, and operating conditions. With the conclusion of these tests, a reexamination of the interrelationship of horsepower and cooling capacity revealed that the factors of power-to-weight ratio, higher speed on grades, and shorter time on grades had a measurable and significant effect upon cooling system performance of the higher horsepower engine installations. These effects are significant enough that it appears desirable to establish a different chassis dynamometer cooling test procedure of these higher-horsepower engines. The implementation of this coolingtest procedure will need to be at a pace which will allow the understanding and consideration of the specific details of the vehicle under study. These details include cab-over versus conventional, radiator frontal area, and others not yet identified.

by J. C. Walter; J. E. Hill
Cummins Engine Co., Inc.
Rept. No. SAE-750131 ; 1975 ; 7p
Presented at the Automotive Engineering Congress and Exposition, Detroit, Mich., 24-28 Feb 1975.
Availability: SAE

HS-016 819

SPEEDS OF CARS ON MOTORWAYS [HIGHWAYS] IN ENGLAND, 1970 AND 1973

The introduction of the 70 mph speed limit in December of 1965 caused a noticeable drop in the speeds of cars on highways. However, further measurements showed that car speeds regained their former level within 3 or 4 years. Since most of the measurements on which these conclusions are based were taken at one location, there was an obvious need for a more extensive survey. Duncan's two-speed method was used: travelling in the traffic stream at two different constant speeds; and obtaining a mean speed, standard deviation, and various percentage points of the speed distribution. Throughout the survey, test-car speeds of 55 and 65 mph were used. Measurements were taken at off-peak times on weekdays, during August and September 1970, and during August, September and October in 1973. It was found that the mean speed of cars rose by 2.5 mph in 3 years. However, this rise was accompanied by a small reduction in the standard deviation.

tion of speed. This seems to be due mainly to reductions in the proportions of faster vehicles (the proportion of cars exceeding 60 mph increased from 60 to 73%). Over all sections included in the 1973 survey, the mean speed of cars was 66.5 mph, with 36% exceeding 70 mph.

by J. E. Eaton; I. J. Burrow
Dept. of the Environment, Transport and Road Res. Lab.,
Crowthorne, Berks., England
Rept. No. TRRL-LR-663; 1975; 16p 4refs
Availability: Corporate author

HS-016 820

ACCIDENTS AT SHOPPING CENTERS

Injury accidents occurring between 1967 and 1969 were compared for off-street and on-street shopping areas. These accidents were analysed according to the number, severity, type, location, time, and weather. Overall, the average number of accidents at off-street areas was 9.25 and 13 at on-street areas. Although limited in scope, the analysis suggested the following conclusions: there were, on the average, 30% fewer accidents at the off-street shopping centers than at the corresponding on-street shopping centers (which were matched for as many variables as possible); the most significant difference in the two types of shopping center was in the lower proportion of pedestrian accidents at off-street centers; Friday was the peak day for both types of centers, but for off-street centers the time was mid-afternoon and for on-street centers early evening.

by J. B. Toomath
Ministry of Transport, Road Transport Division, Private Bag,
Wellington, New Zealand
Rept. No. TRR-7; 1974; 16p
Availability: Corporate author

HS-016 821

**MVMA RESTRAINT STUDY. PROGRESS REPORT,
MARCH 1, 1974-APRIL 10, 1975**

Data on computer files at the Highway Safety Research Institute (HSRI) are summarized; and investigations by Calspan Corp., HSRI and the Southwest Research Institute are included. Only passenger cars of American manufacture are considered. The summary of restraint effectiveness is based on those occupants who have the option of wearing all belts—the outboard front seat occupants. Tables provided include the numbers of case vehicles and outboard front seat occupants, injury severity, and restraint usage.

by R. E. Scott
University of Michigan, Hwy. Safety Res. Inst., Ann Arbor,
Mich.
1975; 33p
Supersedes an earlier progress report covering the same period.
Availability: Corporate author

HS-016 822

**WORKSHOP ON DRIVER EDUCATION
TECHNIQUES, WASHINGTON, 21 JANUARY 1972.
TRANSCRIPT OF PROCEEDINGS**

The objective of the workshop was to formulate the concept of a master driver's license. This would be a program conducted by the states, in which an applicant would have to take some kind of advanced training, or high performance driver training, and then prove his ability both mentally and physically. In this way, there would be an upgrading of the quality of driving. Methods to induce local governments to support, and individuals to participate in such a program are discussed. Attendees spoke and presented slides and films of the programs their organizations were conducting. Specific aspects of driver training discussed included: off-road recovery, skid recovery, evasive maneuvers, controlled braking, tire blowout control, and vehicle dynamics.

National Hwy. Traffic Safety Administration, Office of Driver
Performance Res., 400-7th St., S.W., Washington, D.C.
1972; 224p
Availability: NHTSA

HS-016 823

**A STUDY OF THE EFFECTIVENESS OF A
MOTORCYCLE DRIVER EDUCATION FILM LOOP
PROGRAM FOR REDUCING FATAL CRASH
INVOLVEMENT**

An investigation was made into the effectiveness of the New Jersey Motorcycle Film Loop Program and supporting manual in reducing fatal crashes, and as a substitute for riding experience. The problem was investigated by reviewing the motorcycle fatal crash experience in New Jersey. Based on the findings, five motorcycle driver education film loops were developed. A seventeen page supporting manual was also developed to supplement the film loops. In order to reach 100% of the new motorcycle licensees, permission was gained to incorporate the education program into the existing pre-licensing procedures and to offer the program in all public and private high schools who were willing to include it in their curriculum. In order to conduct a study of the effectiveness of the new materials in reducing fatalities, all motorcycle fatality records for 1971 thru 1973 were reviewed. The 87 pertinent motorcycle fatality cases were entered into the matrix along with the number of new licenses issued for the corresponding periods. Pre-treatment rates were then compared with the post-treatment rates. The major findings were: a reduction of 40.4% in the overall 18 month comparison during the post-treatment period; a reduction of 39.3%, for the post-treatment period, with a seasonally identical 12 month comparison; and, of the 21 variables reviewed for possible influence on the fatality rates reduction, none were found at the .05 level of confidence for the 1-3 month, 4-6 month, 7-9 month, and 10-12 month license holding variable, because of the limited data which was available for statistical analysis.

by L. R. De Carolis
Michigan State Univ.
1974; 162p refs
Doctoral dissertation
Availability: Corporate author

November 30, 1975

HS-016 824

SPEED PLUS FOG--THE DEADLY DUO

The need for proper vehicle maintenance and the role defects play in accidents are stressed, in addition to the role played by speed. Suggestions are made concerning safe driving in hazardous condition. Specific accounts are given of multi-vehicle accidents which had icy or wet road conditions, fog, and speed as contributing causes. Suggestions are made regarding accident avoidance and survival, as well as brake, steering, and wheel defect detection. Emphasis is placed on skid control techniques.

by W. L. Roper

Publ: California Highway Patrolmen v38 n11 p14-5, 40, 42, 47, 49 (Jan 1975)
1975

Availability: See publication

HS-016 825

THE GEOMETRICAL BASIS OF SEAT-BELT FIT

A new method of calculating the acceptability of a seat belt installation is described, from the point of view of seat belt lie. This has a bearing on the safety of the installation, as well as on its comfort. Although a more complicated method than the existing formula, it is geometrically based and therefore takes into account the various interacting factors. For example, the lie of the seat belt over the shoulder depends, among other things, upon the location of the opposite floor anchorage. None of the existing formulas acknowledge this effect, whereas the proposed method allows for it in a natural way. To solve the problem of the fit of seat belts, the occupant is represented by a series of developable shapes, and then the lie of the seat belt may be drawn as a straight line on the developed plane. Any part of the belt which is between the anchorage and the occupant will be naturally developable, as it will be a straight line lying in a plane passing through the anchorage and tangent to the occupant shape. For the purpose of determining seat belt installation acceptability, its expected lie was calculated for two ranges of occupant size: the 10th percentile female and the 95th percentile male. Results of calculations indicate the following: to prevent slippage from shoulder, the clavical line intercept should not be further from the top of the sternum than 175 mm for the female or 211 mm for the male; to prevent neck contact, the intercept on the shoulder line should be no further from the shoulder than 307 mm for the female and 368 for the male; no anchorage should lie forward of the plane formed by the sternum and dihedral lines; to limit the downward force applied to the shoulder during impact, the angle through which the belt turns at the shoulder should not be too high (this angle would vary with the vehicle design).

by J. A. Searle

Publ: Ergonomics v17 n3 p401-15 (May 1974)
1974; 10refs

Includes German summary.
Availability: See publication

HS-016 826

CONTROL OF DRIVERS' SPEED BY MEANS OTHER THAN ENFORCEMENT

Suggests ways in which driver's speed can be influenced other than by the use of mandatory speed limits. The methods discussed are the use of advisory speed signs, the effect of having a speedometer which can be seen while the driver is looking at the road ahead, and the use of road markings which give the driver the illusion that his speed is increasing thereby increasing his desire to slow down. Analysis of accident data before and after the placement of advisory signs on curves in 3 counties in England, showed an effective reduction in the number of accidents. Sixty-three subjects each drove two identical cars, one fitted with a conventional speedometer and one with a head-up (windshield) display speedometer. They each drove the cars 160 kms over a route which contained 19 curves with advisory speed signs. The results were that both the mean speed and 85% of the speeds while negotiating the curves were lower for the vehicles with the head-up display. Tests were conducted in which transverse lines, whose spacings decreased exponentially, were applied to the last 4 km of high speed roads approaching traffic circles. The results showed very significant reductions in accidents.

by K. S. Rutley

Publ: Ergonomics v18 n1 p89-100 (Jan 1975)
1975; 8refs

Includes French and German summaries.
Availability: See publication

HS-016 827

LANE POSITION MAINTENANCE BY AUTOMOBILE DRIVERS ON TWO TYPES OF HIGHWAY

Basic traffic data for daytime driving is given for comparing performance on both two- and four-lane highways. Lane position maintenance was studied by using a photoelectric device that, when mounted on an automobile, made it possible to record the vehicle's track in real-world driving. Twelve subjects were tested. Tests results indicated the following: on the average, drivers position their vehicles almost exactly in the center of a 3.7 m wide lane; dispersions of position measurements about the mean as expressed by standard deviations are small relative to lane widths; band score statistics, which are counts of the numbers of times that the test vehicle crosses imaginary lines on either side of the mean lane position, reveal more information than the standard deviation about score dispersion, because band scores add a frequency dimension; and intersubject and intrasubject variability are remarkably small even though age and experience varied greatly; and steering patterns differed in some respects and were similar in others on the course studied.

by S. M. Soliday

Publ: Ergonomics v18 n2 p175-83 (Mar 1975)
1975; 6refs

Includes French and German summaries.
Availability: See publication

HS-016 828

MORT: THE MANAGEMENT OVERSIGHT AND RISK TREE

The Management Oversight and Risk Tree (MORT) is a complex analytic procedure that provides a disciplined method for determining the causes and contributing factors of major accidents. It is also a format for evaluating the quality of safety programs that are established to control accidents in general. MORT is sufficiently searching and revealing that full-scale analysis of only a few serious accidents or incidents will point to many needed program improvements. A few MORT analyses give more useful information than less rigorous study of large numbers of accidents. Structurally, MORT is a logic tree in the form of a chart that illustrates a long series of inter-related questions. While similar in some respects to fault tree analysis, MORT is more generalized and has several innovative characteristics. It identifies nearly 300 specific problem areas, each having a relevant question. Applied in sequence, these questions probe factors that constitute three major areas of concern: specific oversights and omissions, assumed risks, and general management system weaknesses. MORT incorporates traditional safety concepts such as hazard view, life cycle, human factors engineering, and job safety analysis, as well as innovative safety concepts such as barrier analysis, the effects of change, and energy transfer phenomena. MORT focuses on a rational assessment of management control systems. Management program elements are specified in extensive detail and judged to be adequate or less than adequate. Once completed, the MORT procedure provides an all-important visibility to the accident analysis process that enables the investigator to review the findings of others, alter the analysis as additional facts warrant, and record the total effect for later use. MORT represents a major theoretical and practical contribution to safety technology.

by W. G. Johnson

Publ: Journal of Safety Research v7 n1 p4-15 (Mar 1975)
1975 ; 15refs

Availability: See publication

HS-016 829

WISCONSIN LAUNCHES CHILDSAFE PROGRAM

Project Childsafe is an experiment in promoting child restraint education by going directly into the hospital to reach new mothers. The slide/sound program together with posters and brochures emphasizes the special restraint requirements of automobile passengers under the age of four. Ninety percent of the new mothers followed through by purchasing acceptable restraints. Some hospital gift shops are offering both new and used infant and child restraints for sale.

by J. Fernan

Publ: Traffic Safety v75 n3 p22-4 (Mar 1975)
1975

Availability: See publication

HS-016 830

INFANT CARRIERS AND CHILD RESTRAINTS

Consumers Union made a test of 19 models of child restraints. To simulate actual crash conditions, an acceleration sled was used with a dummy representing a 3 year old child. A smaller doll was used to test the infant carriers. Based on the available

data, the safest place for a child is the center of the rear seat, which was the test location used. Tests were made of 30 mph head-on and front corner crashes, as well as 12 mph side impacts.

Publ: Consumer Reports v40 n3 p150-2 (Mar 1975)
1975

Availability: See publication

HS-016 831

MARIJUANA AND DRIVING IN REAL-LIFE SITUATIONS

The effects of low and high doses of marijuana on driving performance were determined in both a restricted, traffic-free driving course and on the streets of Vancouver, Canada. The effects of marijuana and driving on the heart rate was also analyzed. For the driving course portion, 64 subjects (43 men and 21 women) were assigned to one of three groups as follows: a group given low doses of the drug; a group given high doses of the drug; and a group given a placebo. Of these subjects, 38 participated in the street driving portion of the study, and were assigned to one of four groups: a group given low doses prior to the first driving session and a placebo for the second; a group given a placebo first and then a low dose; a group given a high dose for the first and a placebo for the second; and a group given a placebo first then a high dose. The test gave conclusive evidence that smoking marijuana does have a detrimental effect on driving skills and performance in a restricted driving area, and that this effect is even greater under normal conditions of driving on city streets. The smoking of marijuana potentiated the stress of driving, and subjects who drove in the streets and those who drove on the course showed almost identical tachycardia.

by H. Klonoff

Publ: Science v186 n4161 p317-24 (Oct 1974)
1974 ; 13refs

Supported by grant from the British Columbia Alcohol and Drug Fund.

Availability: See publication

HS-016 832

PROBABILITY OF ARREST WHILE DRIVING UNDER THE INFLUENCE OF ALCOHOL

A method of determining the probability of being arrested for driving under the influence (DUI) is described, and then applied to a driver with a given blood alcohol concentration (BAC) who comes under the surveillance of a police officer skilled in the detection of drunken drivers. To compute the probability of arrest as a function of BAC, it is necessary to know the unconditional probability of being arrested. A random survey was conducted in the test area before the start of the test to determine the BAC distribution of the population of drivers who are not arrested. A specific route was then patrolled for 2-hr periods by police. The time and location of each arrest and the BAC of the driver and number of vehicle checks were recorded. Counts of traffic volume were made each night. The entire test area was 8 miles. A total of 119 hours were spent on patrol over 66 days, resulting in 22 DUI arrests and 116 vehicle checks. The average BAC of the 20 drivers who consented to breath test was 0.171%, in close agreement with the average of 0.173% in drivers arrested on normal patrols. The conclusion of the data analysis is that the

probability of being arrested for DUI is only 1 in 100, under the best conditions. Also, 19% of the vehicles showing erratic behavior were driven by drunken drivers.

by G. A. Beitel; M. C. Sharp; W. D. Glauz

Contract DOT-HS-077-1-100

Publ: Journal of Studies on Alcohol v36 n1 p109-16 (Jan 1975)

1975; 2refs

Availability: See publication

HS-016 833

EFFECTS OF ALCOHOL ON A CRITICAL TRACKING TASK

The effectiveness of the Critical Tracking Task (CTT), an unstable compensatory tracking task, in discriminating intoxicated from sober subjects was explored. The degree of intoxication was determined by blood alcohol content (BAC) tests, the purpose being to develop a simple, relatively rapid and effective psychomotor task which could be used to prevent drunken drivers from starting their cars. Twenty subjects were asked to operate a device with a cathode-ray tube display, an isometric control stick, and a dynamic controlled element. Based on the results, it appeared that alcohol strongly decreases CTT performance. Significant differences were observed at BACs below 0.05% in about half the subjects (mostly moderate drinkers). At BACs greater than 0.10%, over 90% of the subjects had degraded performance. The degree of degraded performance should be large enough for practical use in discriminating intoxicated from sober drivers. For example, there was more than a 20% reduction in performance when BAC exceeded 0.10%, the legal impaired-driving limit in most states. Somewhat surprisingly, the variance of test scores was not affected by alcohol. Moderate drinkers showed a bigger decrement in CCT performance at a given BAC than heavy drinkers. The subjects that had the largest degradation in performance on the CCT also had the largest degradation in performance on the Romberg test.

by R. H. Klein; H. R. Jex

Publ: Journal of Studies on Alcohol v36 n1 p11-20 (Jan 1975)

1975; 11refs

Availability: See publication

HS-016 834

SELF-EVALUATION OF PERFORMANCE AND THE ABILITY TO DISCRIMINATE BLOOD ALCOHOL CONCENTRATIONS (BAC)

Social drinkers were examined in regard to their expectations about the effects of alcohol on performance and differences in these judgments as a function of BAC-discrimination training. Two groups of 10 men each were used as subjects (matched by age and drinking experience) and given a task requiring efficient, rapid execution utilizing intellectual concentration on information processing, as well as eye-hand coordination. The evidence suggests a characteristic pattern of expectancies about the effects of low doses of alcohol. Social drinkers generally expect their performance to become increasingly impaired as alcohol levels rise. They tend to predict a given amount of impairment at a particular BAC, regardless of whether it occurs during rising or falling alcohol concentrations. Even when they are experiencing the drug effects, they do not expect the acute recovery of performance which occurs when the BAC begins to fall. Prior training in discriminating

BAC does not alter this pattern of expectancies, but it does seem to distort the evaluation of the effects of alcohol on performance while drinking. In contrast to untrained individuals, expectation of impairment by trained subjects are greatly exaggerated.

by M. Vogel-Sprott

Publ: Journal of Studies on Alcohol v36 n1 p1-10 (Jan 1975)

1975; 3refs

Research supported by the Licensed Beverage Industries, Inc., New York; and the Non-Medical Use of Drugs Directorate, Dept. of National Health and Welfare, Canada.

Availability: See publication

HS-016 835

AN EXAMINATION OF THE PERFORMANCE OF SPARK IGNITION ENGINES USING HYDROGEN-SUPPLEMENTED FUELS

The performance of a hydrogen-supplemented fuels system is predicted using a semi-empirical model. The prediction of this model is compared to data obtained during engine dynamometer tests of a hydrogen generator/multicylinder engine system. The test data and the predictions are also compared with the fuel consumption and emissions of the same engine in its stock configuration. They indicated that the hydrogen-supplemented fuels system can improve the brake specific fuel consumption 10-15% and simultaneously reduce nitrogen oxide emissions to a level consistent with the 1977 EPA standard. The performance of an optimized hydrogen generator/engine system is estimated. With these comparisons and estimates used as a basis, the potential of the hydrogen-supplemented fuels system is identified.

by J. F. Stocky; M. W. Dowdy; T. G. Vanderbrug

California Inst. of Tech.

Contract NAS-7-100

Rept. No. SAE-750027; 1975; 15p 10refs

Presented at the Automotive Engineering Congress and Exposition, Detroit, Mich., 24-28 Feb 1975. Sponsored in part by the Environmental Protection Agency.

Availability: SAE

HS-016 836

NIGHT REFLECTIVITY OF COLORED PAVEMENTS. FINAL REPORT

The effect is determined of delineating the median storage area of the intersection of a four-lane highway with a two-lane highway on the operational safety of that intersection. Colored pavement was used to provide a color contrast median between the median storage area and the through lanes of travel, thus delineating the median storage area for a motorist on the side road. A secondary objective was to develop a method of providing a nighttime visibility to the color in the pavement. The results indicated that given the degree of delineation provided by the colored pavement, the delineation of the median has no effect on the operational safety or the operational efficiency of the intersection. A satisfactory method of providing adequate nighttime visibility to the color in the pavement was not found.

by T. J. Foody; J. S. Hubbell

Ohio Dept. of Transportation, Box 899, Columbus, Ohio 43216

Rept. No. OHIO-DOT-06-73; 1974; 104p 7refs

Study conducted in cooperation with the Federal Hwy.

Administration.

Availability: Corporate author

HS-016 837

A PRIMER ON CRUISE CONTROLS

The benefits and types of cruise controls available are reviewed. The benefits are in the areas of speed limit observation, driver comfort (on long trips) and fuel economy. The cruise control package consists of four basic units: the driver's controls, the speed sensor, the speed controller, and the power servo. The mechanical operation of variations on these units are described, as well as safety features to insure cruise override when desired. Diagrams of several systems and photographs of some components are included.

by L. Givens

Publ: Automotive Engineering v83 n6 p26-32 (Jun 1975)

1975

Availability: See publication

HS-016 838

FIRE PROTECTION FOR OFF-HIGHWAY VEHICLES

The importance of fire control systems on off-road vehicles is discussed. A detailed description of an automatic system developed for large trucks is given. This system operates by combining and using output signals from two different types of fire sensors: a flash fire sensor for instantaneous extinguisher activation, and a time delay sensor for slower fires. The mechanical and electronic components, such as thermal and optical sensors, control panel monitor with warning indicators, and audible warning alarms, and their operation within the automatic and manual extinguishing systems are explained.

by R. B. Stevens

Publ: Automotive Engineering v83 n6 p34-7 (Jun 1975)

1975

Based on SAE paper 750561, "Fires On Large Off-Road Vehicles: The Problem and Solution" presented at the SAE Earthmoving Meeting, Peoria, Ill., 15-16 Apr 1975.
Availability: See publication

HS-016 839

ADVANCED CIRCUITS AND DISPLAYS FOR ELECTRONIC INSTRUMENTATION

Advances in circuitry controls of automotive solid-state instrumentation are being made in Britain. The digital speedometer and odometer display both mile and kilometer units. Simplification and reduction in size of the panel is obtained by combining the function of the digital clock with the odometer. Concentrated interest in liquid crystal and direct current electroluminescence devices for display elements is expressed, and details of their operation and construction are given. Flashing emergency warning lights are found to have the advantage of lower battery current usage.

by D. Scott

Publ: Automotive Engineering v83 n6 p38-41 (Jun 1975)

1975

Availability: See publication

HS-016 840

THE DIESEL ENGINE FOR TRUCK APPLICATION

Because of its outstanding fuel economy and its somewhat lower maintenance costs, the diesel engine has become dominant in the transportation field, especially for heavy-duty trucks. There is evidence that use of diesel engines in medium- and light-duty trucks, as well as in passenger cars will increase in the future. Most diesel engines are installed in commercial vehicles. However, if the engine is not carefully matched to the transmission and accessories, as well as to the specific vehicle application (severity of duty), the total package may be commercially unattractive. The most important considerations are detailed in matching diesel engines with transmission and components, for use in commercial vehicles, specifically truck application. The market currently served by diesel engines is surveyed, and an overall view of the engine application process is given. Engine-transmission-vehicle matching and performance is discussed. The engine services supplied by the vehicle, such as the provision of cool and clean air, water, oil, and fuel, exhaust removal, engine mounting, temperature control of the engine, coolant flow arrangements, accessories, and cold weather operation are detailed. Noise and exhaust emissions are also discussed.

by P. S. Myers

Mechanical Engineering Dept., Univ. of Wisconsin

Rept. No. SAE-750128; SAE-SP-391; 1975; 26p 18refs

Presented as the 21st L. Ray Buckendale Lecture.

Availability: SAE

HS-016 841

VEHICLE ANALYTICAL DESIGN FOR STRUCTURAL CRITERIA--AN OVERVIEW

Papers dealing with vehicle system analysis and structural design are presented. Specifically discussed are: the organization and quantification of input conditions for vehicle system analysis; procedures for selecting suspension system pivot points; finite element and test modeling for structural subsystem analysis and synthesis techniques; and analytical techniques for front-end and passenger compartment design.

Society of Automotive Engineers, Inc., 400 Commonwealth Dr., Warrendale, Pa. 15096

Rept. No. SAE-SP-392; 1975; 45p refs

Includes HS-016 842--HS-016 845.

Availability: SAE

HS-016 842

QUANTIFICATION OF INPUTS FOR VEHICLE SYSTEM ANALYSIS

General methods are discussed for the organization and quantification of input conditions for vehicle ride comfort prediction and vehicle component fatigue life estimation problems. For the vehicle ride prediction problem, the system is a vehicle, which is excited by the road input (a quantitative model providing the mechanism for the determination of specific displacement inputs to the wheels from general road surface properties), and the desired output is the resulting ride comfort of the vehicle occupants (a "human vibration sensitivity model" translating vibration environment in the passenger compartment into levels of human comfort). The most widely used method for the measurement of road profile is the interaction

of a tracking wheel with a linear potentiometer, the vertical motion of which is sensed by an accelerometer. The road profile data are recorded on an analog tape recorder. It has been found that a power spectral density function, the knowledge of the roughness coefficient with corresponding values of waviness, is considered to be sufficient to define the road completely. The overall analysis task for the vehicle component fatigue life prediction problem can be separated into three parts: an input quantification model, which determines the history of loads acting on a component for a specified vehicle-customer environment; a component structural model, which determines the strain-time histories in critical areas of the component; and a life prediction model, which estimates the fatigue life of the component part. Only the input quantification model is dealt with, which is subdivided into two parts: the vehicle system model, which determines the history of forces and moments acting on a component due to external forces acting on the complete vehicle system, and the vehicle operation model, which determines the history of external forces acting on the vehicle due to a mixture of road surfaces and specific maneuvers imposed on the vehicle. Vehicle system external forces would include tire/road interface, engine torque, moments on the steering wheel, and forces on the brake pedal.

by A. A. Butkunas; S. L. Bussa
Ford Motor Co.

Publ: HS-016 841 (SAE-SP-392) Vehicle Analytical Design For Structural Criteria—An Overview, Warrendale, Pa., 1975 p1-10
Rept. No. SAE-750133; 1975; 21refs
Availability: In HS-016 841

HS-016 843

SUSPENSION SYSTEM MODELING AND STRUCTURAL LOADING

An overview of the procedure leading to the selection of suspension system pivot points is presented. A method of resolution for terrain and maneuver loads at the tire contact patch to the vehicle's structure is shown. And the modeling technique used for stress analysis of suspension system components is illustrated, along with examples of suspension system models used to aid in the solution of ride and handling problems. In car design, wheel rates, tire characteristics, sprung and unsprung weight estimates, and mass moments of inertia are teamed with a vehicle dynamics program to establish suspension geometry characteristics that result in acceptable handling. Vehicle dynamics programs specify suspension geometry as the caster, camber and toe curves on the spindle with respect to the car coordinate system for different positions of jounce and rebound. A linkage system must then be devised to maintain this geometry. The FRTSUSP and NASTRAN computer programs are discussed in this context. Suspension component stress analysis is tested in one of three ways: traditional stress analysis and machine design of parts having few changes in section, such as pivot bars, torsion bars, lower control arm struts, and rubber parts; finite element models composed of solid section beam elements, possibly including the aforementioned parts, but also cast and forged parts, such as steering knuckles, knuckle arms, and anti-roll bars; and finite element models composed of plate elements, and stamped parts such as control arms. The design procedure and method of modeling specific components of the suspension system are discussed (upper and lower arc pivot bars, ball joints, tie end rods, control arms, suspension springs, knuckles and knuckle arms). The overall purpose of the suspension

system analysis techniques described have been to provide an optimum design with a high confidence factor before drawing release dates; and to reduce the total design cycle time and cost reduction of development work required on physical parts.

by R. L. Davis

Chrysler Corp.

Publ: HS-016 841 (SAE-SP-392) Vehicle Analytical Design For Structural Criteria—An Overview, Warrendale, Pa., 1975 p11-20

Rept. No. SAE-750134; 1975; 6refs

Availability: In HS-016 841

HS-016 844

STRUCTURAL AND SYSTEM MODELS

System modeling as it applies to structural vibration in the vehicle shake frequency range (9-25Hz) is illustrated. The emphasis is on the applicability of the approach to a variety of structural subsystem analysis and synthesis techniques. Finite element and test modeling procedures are presented in an introductory manner with references provided to furnish the theoretical aspects. Comparisons of each modeling method are discussed from the vantage point of using the simplest approach to obtain the required results. The system modeling approach to structural vibration in the vehicle shake frequency range presents a viable alternative to hardware testing. The practicality of the procedure arises from the division of the system into the major subsystems for analysis. This division makes it possible to use the best analysis technique for each subsystem to assure the simplest approach necessary to obtain the required results. This usually produces a system model composed of both finite element and test model subsystem representations. Judicious application of modal modeling and condensation techniques in the preprocessing and analysis stage can dramatically reduce the problem size (and cost) with no reduction in accuracy. The predictive capability of the resulting model has enhanced the position of the technique among the traditional engineering methods.

by J. K. Horvath

General Motors Corp., Cadillac Motor Car Div.

Publ: HS-016 841 (SAE-SP-392) Vehicle Analytical Design For Structural Criteria—An Overview, Warrendale, Pa., 1975 p21-30

Rept. No. SAE-750135; 1975; 23refs

Availability: In HS-016 841

HS-016 845

PRELIMINARY VEHICLE STRUCTURAL DESIGN FOR COMPARISON WITH QUANTITATIVE CRITERIA

Quantitative design criteria combined with computer analysis methods can facilitate the structural design of an automotive vehicle. Two examples of computer aided preliminary design are given. The examples demonstrate analytical techniques applied at two different stages in the design process for a compact size (non-production) car. In the first example, analysis is applied to insure that the front-end structure of the project vehicle is designed to withstand anticipated in-service loads. In the second example, structural dynamic analysis of the total vehicle system is performed to determine vibration response quantities in the passenger compartment. These quantities are

compared with whole-body vibration criteria to assess passenger ride quality.

by K. S. Skatsum; J. F. Harris; L. J. Howell

General Motors Corp.

Publ: HS-016 841 (SAE-SP-392) Vehicle Analytical Design For Structural Criteria—An Overview, Warrendale, Pa., 1975 p31-42

Rept. No. SAE-750136; 1975; 24refs

Availability: In HS-016 841

HS-016 846

INTER-INDUSTRY EMISSION CONTROL, PROGRAM 2 (IIEC-2). PROGRESS REPORT 1

Papers are presented concerning various emission control programs undertaken by industry. Fuel economy and engines' emissions are discussed in terms of exhaust gas recirculation, trade-offs with engine performance, catalyst development, and fuel mixtures, such as methanol.

Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pa. 15096

Rept. No. SAE-SP-395; 1975; 250p refs

Includes HS-016 847—HS-016 854.

Availability: SAE

HS-016 847

INTER-INDUSTRY EMISSION CONTROL PROGRAM. IIEC-1—A COMPREHENSIVE SUMMARY. IIEC-2—GOALS AND PROGRAMS

Lists of publications and patents resulting from the IIEC program are given. A background summary of the program and a discussion of the technical accomplishments is presented, which include using a systems-oriented approach combining laboratory studies with on-the-road vehicle testing, in such areas as hydrocarbon (HC), carbon monoxide (CO), and nitrogen oxides (NOx) exhaust emission control, and evaporation loss control. When emphasis was centered on HC and CO emission control through the use of thermal reactors, 93,000 miles of durability tests were conducted. As interest shifted to oxidation catalysts for HC and CO control, mathematical models were developed relating HC/CO oxidation catalyst performance to catalyst properties and feed gas parameters. These models expedited catalytic converter design studies by permitting computer simulations to replace lab experiments. Mathematical optimization of converter parameters proved useful for both pelleted and monolithic catalysts. Fuel, lubricant, and thermal effects on oxidation were extensively studied. Control of NOx formation was approached primarily through exhaust gas recirculation (EGR) with assistance from air-fuel ratio control and spark timing programming. Many EGR control systems were designed and tested, using exhaust back pressure, carburetor venturi or spark vacuum, as the control signal for modulating the recirculation of exhaust gas. A technique was developed to use cycle-to-cycle variations in cylinder pressures and/or variations in brake torque as an indicator of vehicle driveability, which can be used to determine trade-offs between EGR, air-fuel ratio, and ignition timing vs. driveability, emissions, and economy. Tests of hundreds of compositions led to metallic NOx reduction catalysts and the development of a major monolithic NOx catalyst, which also reduced ammonia formation. The development of a pulse flame generator for simulating an engine exhaust atmosphere

facilitated catalyst testing. Finally, control concepts were assembled in prototype vehicle systems and subjected to lab emission tests, as well as on-the-road performance tests.

by L. J. McCabe; C. B. Chase

Mobile Res. and Devel. Corp.; Ford Motor Co.

Publ: HS-016 846 (SAE-SP-395), Inter-Industry Emission Control, Program 2 (IIEC-2), Progress Report 1, Warrendale, Pa., 1975

1975; 14p

Availability: In HS-016 846

HS-016 848

THE EFFECTS OF EXHAUST GAS RECIRCULATION AND RESIDUAL GAS ON ENGINE EMISSIONS AND FUEL ECONOMY

Three exhaust emissions, hydrocarbons (HC), carbon monoxide (CO), and oxides of nitrogen (NOx), from the automotive spark-ignition engines are presently subject to regulatory control. Of these harmful pollutants, NOx emissions are the hardest to control, at the current level of emission control technology. Accordingly, exhaust gas recirculation (EGR) has been receiving continued attention, as promising NOx control. This paper reports the effects of EGR on the mechanism of NOx reduction and engine fuel economy. Research has been conducted in the following areas: NOx formation in a combustion vessel; studies on EGR effects in a single-cylinder engine; and the effects of EGR on NOx and HC emissions and fuel economy. The experiments and studies conducted revealed the following facts: the use of EGR is an effective means of controlling NOx with less penalty on fuel economy; although EGR alone won't reduce NOx emissions to the prescribed standard levels, its use in conjunction with the leanest possible fuel mixture and MBT ignition timing may provide sufficient NOx control; external EGR increases HC emissions which can be reduced with lean mixtures and delayed ignition timing; EGR can be used to provide better fuel economy without influencing CO emissions; where the rates of fuel oxygen (O2) and nitrogen (N2) concentrations are varied in a wide range, O2 and N2 concentrations in the combustion gas, along with mixture strength are major factors in NOx formation; NOx reduction effect by EGR is caused partly by combustion gas temperature drops and partly by O2 concentration decreases in the post flame; when reducing O2 concentration and proportionately increasing N2 concentration, the excess oxygen coefficient, at which the maximum NOx concentration is attained, becomes smaller; the total EGR flow, inclusive of both external and internal EGR, can be determined by calculating from the carbon dioxide concentration under engine compression stroke, air/fuel ratio, and external EGR ratio; and that in the case of a constant total EGR flow, NOx reduction is identical irrespective of the ratio of internal and external EGR involved.

by Y. Kaneko; H. Kobayashi; R. Komagome

Mitsubishi Motors Corp.

Publ: HS-016 846 (SAE-SP-395), Inter-Industry Emission Control, Program 2 (IIEC-2), Progress Report 1, Warrendale, Pa., 1975

Rept. No. SAE-750414; 1975; 33p

Availability: In HS-016 846

HS-016 849

TRADE-OFFS BETWEEN ENGINE EMISSION CONTROL VARIABLES, FUEL ECONOMY, AND OCTANE

A single cylinder RDH spark ignition, gasoline engine operating at constant speed and load was used to study the effects of compression ratio, spark timing, exhaust gas recirculation (EGR) rate, and air/fuel (A/F) ratio on exhaust emissions, fuel economy, and octane requirements. Analyses showed that fuel consumption decreased with increased compression ratio at any given nitrogen oxides (NOx) emission level. Minimum fuel consumption was obtained at the highest compression ratio studied, when basic engine hydrocarbon (HC) emissions were not a constraint. However, if both HC and NOx emissions were constrained at constant low levels by optimal adjustments of EGR and spark timing, both the minimum fuel consumption and minimum octane number for trace knock were achieved at the lowest compression ratio studied. Furthermore, overall minimum fuel consumption at controlled HC and NOx levels was obtained at the leanest A/F ratio (15.4) studied. Therefore, these data indicate that the historically accepted improvement in engine efficiency with increasing compression ratio may not always be achieved when HC and NOx must be constrained due to emission requirements.

by C. R. Morgan; S. S. Hetrick
Mobile Res. and Devel. Corp.
Publ: HS-016 846 (SAE-SP-395), Inter-Industry Emission Control, Program 2 (IIEC-2), Progress Report 1, Warrendale, Pa., 1975
Rept. No. SAE-750415 ; 1975 ; 33p 14refs
Availability: In HS-016 846

HS-016 850

AN APPROACH TO THE LOW EMISSION ENGINE WITH THE CONSIDERATION OF FUEL ECONOMY

Optimum "trade off" parameters between catalyst emission control and fuel economy are established, assuming that any increase in hydrocarbon (HC) emissions could be controlled with an effective HC/carbon monoxide (CO) oxidation catalyst. The fundamental concept employed was that the application of exhaust gas recirculation (EGR) to the engine increased the heat capability of the working gas in the combustion chamber and therefore became the most economical method for control of nitrogen oxides (NOx). Tests were conducted comparing the effects of EGR and retarded spark on the control of NOx emissions. Test results showed that, in terms of fuel consumption, EGR is a superior method to control NOx. In another comparative test, EGR was shown to be superior to lean and rich air/fuel mixtures in NOx control. Using a mathematical model for evaluating optimum combustion process control of NOx emission and resultant fuel economy, it was found that a reduction in spark advance decreased NOx formation. Several methods for HC control were tested: increasing engine compression, increasing cooling temperature, and using an oxidation catalyst. The following conclusions were arrived at: the use of EGR is the most promising method of NOx control when considering fuel economy; in order to control NOx by EGR, without a fuel penalty, spark timing must be advanced in proportion to EGR rate; the NOx control limit is about 60% reduction for a practical trade off between HC and brake specific fuel consumption; octane requirements would be reduced more than 10 numbers at wide open throttle by 5% EGR; and a HC/CO oxidizing

catalyst provides an economical method of emission control balanced with fuel economy.

by H. Kuroda; Y. Nakajima; Y. Hayashi; K. Sugihara
Nissan Motor Co., Ltd., Yokosuka, Japan
Publ: HS-016 846 (SAE-SP-395), Inter-Industry Emission Control, Program 2 (IIEC-2), Progress Report 1, Warrendale, Pa., 1975
Rept. No. SAE-750416 ; 1975 ; 27p 4refs
Availability: In HS-016 846

HS-016 851

[NITROGEN OXIDE] NOX REDUCTION CATALYST DEVELOPMENT

Kinetics of ammonia formation to delineate engine conditions, for best net nitrogen oxides (NOx) efficiency and to expand the choice of emission control systems, were studied. These studies have been carried out in the laboratory with exhaust gases generated by a pulse flame generator and rhodium containing catalysts. Catalyst selectivity, ammonia/nitrogen was found to vary linearly with the carbon monoxide/oxygen ratio in the exhaust gas and with the reciprocal of the space velocity. The effects of temperature and input NOx levels are more complex: selectivity shows a maximum in the range of 750-1300° F and increases gradually, as the NOx level is decreased from 800 to 100 ppm. Based on these results, a mechanism is proposed for ammonia formation; and a triple-catalyst system is suggested for increasing net NOx efficiency.

by G. H. Meguerian; F. W. Rakowsky
Amoco Oil Co., Res. and Devel. Dept.
Publ: HS-016 846 (SAE-SP-395), Inter-Industry Emission Control, Program 2 (IIEC-2), Progress Report 1, Warrendale, Pa., 1975
Rept. No. SAE-750417 ; 1975 ; 23p 14refs
Availability: In HS-016 846

HS-016 852

ESTABLISHMENT OF ORI CHARACTERISTICS AS A FUNCTION OF SELECTED FUELS AND ENGINE FAMILIES

Octane requirements of 55 cars, representing five Ford engine families, were determined every 2000 miles during a deposit accumulation schedule consisting of city, suburban and highway operations. Five cars from each engine family were operated on certification durability fuel to establish the octane requirement increase (ORI) variation within and between families. Additional cars and fuels were used to investigate the effects of lead content, a detergent additive, and higher boiling point fuel components on ORI. The data obtained show that among engine families there were characteristic differences in ORI and that the initial ORI buildup occurred more rapidly when the investigated detergent additive was used. The fuel with reduced tail-end volatility was found to increase ORI. ORI with leaded versus unleaded fuels was found to be greater with unleaded fuels but with wide variation between the engine families studied.

by H. T. Niles; R. J. McConnell; M. A. Roberts; R. Saillant
Ford Motor Co., Scientific Res. Staff
Publ: HS-016 846 (SAE-SP-395), Inter-Industry Emission Control, Program 2 (IIEC-2), Progress Report 1, Warrendale, Pa., 1975
Rept. No. SAE-750451 ; 1975 ; 20p 6 refs
Availability: In HS-016 846

HS-016 853

METHANOL-GASOLINE BLENDS PERFORMANCE IN LABORATORY TESTS AND IN VEHICLES

Blends of up to 20% methanol in gasoline were evaluated in both engine dynamometer and controlled vehicle tests, and in a 50,000 mile road test. Performance comparisons between methanol blends and base gasolines were made in vehicle driveability and vapor lock tendency, engine deposits and wear, fuel economy, exhaust emissions, compatibility with fuel system materials, and phase stability of the blends. Vapor lock tests in six 1974 cars strongly suggested that the vapor lock tendency of methanol blends is greater than would be predicted for gasolines having the same volatility characteristics. Cold start and warm-up driveability of two 1974 cars at 70° F depreciated as the methanol concentration increased in base fuels of three volatility levels. These driveability data were found to correlate well, at a given methanol concentration, with fuel volatility characteristics described by means of a new fuel vaporization pressure technique. Engine deposits, rusting, wear, and crankcase oil performance were not significantly affected by methanol in gasoline when evaluated in four laboratory engine tests and in the four-car, 50,000 mile road test. Fuel consumption was found generally to increase with increasing methanol concentration, while exhaust emissions from both vehicles and stationary engines varied as expected from the stoichiometric air/fuel ratio of the blends. With the possible exception of copper and brass, screening tests with methanol blends indicated no serious potential compatibility problems with the fuel system metals tested or with Buna N or Neoprene rubbers. Methanol solubility in gasoline was shown to be increased by co-solvent alcohols. These also increased the stability of blends to phase separation by added water, but still phase separation occurred with as little as 0.1 or 0.2% water.

by A. W. Crowley; J. P. Kuebrich; M. A. Roberts; W. J. Koehl; W. L. Wascher; W. T. Wotring
Atlantic Richfield Co.; Ford Motor Co.; Mobil Res. and Devel. Corp., Standard Oil Co. (Ohio)
Publ: HS-016 846 (SAE-SP-395), Inter-Industry Emission Control, Program 2 (IIEC-2), Progress Report 1, Warrendale, Pa., 1975
Rept. No. SAE-750419; 1975; 60p 14refs
Availability: In HS-016 846

HS-016 854

COMBUSTION AND EMISSION CHARACTERISTICS OF METHANOL

A single cylinder engine was used to study the combustion and emission characteristics of methanol and indolene clear fuel. Measurements of ignition delays, combustion intervals, power, and exhaust emissions were made over a range of speeds, loads and air-fuel mixture ratios. The results were used to determine the difference in relative power, efficiency, and emissions between the two fuels. Relative to indolene, methanol exhibited faster overall burning rates, (shorter ignition delay periods and combustion intervals). At the same engine air flow and equivalence ratio, methanol produced more power than indolene. Fuel consumption with methanol was higher but the energy consumption rate was lower. Nitric oxide emissions with methanol are generally lower but, depending on equivalence ratio, carbon monoxide and hydrocarbon emis-

sions are less than, equal to or greater than those with indolene fuel.

by J. A. Harrington; R. M. Pilot
Ford Motor Co., Scientific Res. Staff
Publ: HS-016 846 (SAE-SP-395), Inter-Industry Emission control, Program 2 (IIEC-2), Progress Report 1, Warrendale, Pa., 1975
Rept. No. SAE-750420; 1975; 37p 13refs
Availability: In HS-016 846

HS-016 855

WINDSCREEN [WINDSHIELD] DIRT AND SURFACE DAMAGE EFFECTS

Measurements were taken of the amount and prevalence of windshield dirt and surface damage in a sample of 40 passenger cars, with both very low and very high mileage; in order to evaluate: the ability to see through dirt and surface damage in a static and a dynamic driving situation; and to evaluate the practicability of resurfacing windshields. Extensive measurements were made of windshield veiling luminance, in relation to glare and windshield damage (road dirt, cleaning abrasive scratches, road material pock marks, and windshield wiper scratches). The scratches were found to be of greater consequence on clean windshields, with cleaning scratches being more severe than wiper scratches, depending on the sources of glare (solar and street light). Windshields can however, be satisfactorily resurfaced by skilled technicians. It is recommended that: the rubber used in windshield wipers be improved to reduce damage; the cleaning techniques used for hand cleaning in service stations be improved; that public awareness of the problem be increased; and the damaged windshields be resurfaced or replaced.

by M. J. Allen
Publ: Australian Road Research v5 n6 p7-19 (Dec 1974) 1974; 10refs
Supported by the Australian Road Res. Board (ARRB Proj. no. 95290) and by the Victorian Coll. of Optometry of Melbourne Univ.
Availability: See publication

HS-016 856

TRAFFIC SPEED REPORT NO. 92. INTERIM REPORT

The results of the 1974 study of free-flowing automobile and truck speeds on rural tangent, level sections of interstate, and 4- and 2-lane highways in Indiana are reported. The average speeds for passenger cars were 57.8 mph, 7.4 mph less for 1974 than for 1973, and 55.1 mph, 3.7 mph less for trucks. This reduction is undoubtedly due to the lowering of the maximum speed limit to 55 mph. The decrease occurred with implementation of the mandatory speed limit in March 1974 and remained about the same through August 1974. The findings also indicate that vehicle speeds on highway types are much less a variable than 1973, a factor which reduces conflict between vehicles and improves safety.

by A. A. Gadallah; T. M. Borg; G. K. Stafford
Joint Hwy. Res. Proj., Civil Engineering Bldg., Purdue Univ., W. Lafayette, Ind. 47907
Rept. No. JHRP-74-17; 1974; 33p
Prepared in cooperation with the Indiana State Hwy. Commission. Rept. 91 is HS-014 842.
Availability: Corporate author

HS-016 857

STUDY OF COLLECTOR--DISTRIBUTOR ROADS. FINAL REPORT

Information about the design and use of collector-distributor (C-D) equipped interchanges is provided. A review of state design standards and policies, and a review of the literature was made. A study was made of the operation and accidents at four interchanges equipped with C-D roads and three interchanges without C-D roads in Indiana. Operations were filmed and erratic maneuvers counted. Costs for construction, maintenance, and operation were calculated for typical examples of C-D and non-C-D interchanges. The results showed agreement among design experts favoring C-D road use as a design ideal of minimize weaving, improve operation, and generally improve design. Analysis of accident rates for 100 million vehicles, by total number and by type showed only weaving-type accidents to be significantly different, with C-D sites experiencing fewer accidents than non-C-D sites. Construction costs were higher for C-D interchanges, as were maintenance costs. Operating costs were not different at low volumes, yet based on assumptions of likely higher volume operating conditions, the C-D interchange would have lower operating costs.

by R. S. Hansell
Joint Hwy. Res. Proj., Civil Engineering Bldg., Purdue Univ.,
W. Lafayette, Ind. 47907
Grant HPR-1 (12) Part 2
Rept. No. JHRP-75-1 : 1975 : 151p 48refs
Prepared in cooperation with the Federal Highway
Administration, and the Indiana State Hwy. Commission.
Availability: Corporate author

HS-016 859

EVALUATION OF THE 55 MPH SPEED LIMIT. FINAL REPORT

The effect of the 55 mph speed limit was determined for rural primary highways in Indiana. Spot speed data was collected at 12 established speed stations for comparison with previous years. Speeds for 1974 averaged 5-10 mph below their 1973 counterparts. Observed speeds were statistically lower in 1974 for passenger cars and heavy trucks on all but one class of rural highway. The only exception was for heavy trucks on 2-lane highways, where no significant reduction in mean speed was found. An analysis of traffic volumes for the first 6 months of 1974 indicated that they were 13% less than the projected volumes for 1974 and 6.4% less than the volumes for the first 6 months of 1973. Accident rates for the first 6 months of 1974 were compared to rates for the first 6 months of the three previous years. The rate for the total number of accidents for each class of highway significantly decreased in the first 6 months of 1974. The reduced observed speeds and traffic volumes suggested a 55 million gallon gasoline savings in the first 6 months of 1974 over the same period in 1973.

by T. M. Borg
Purdue Univ., Joint Hwy. Res. Proj., West Lafayette, Indiana
Rept. No. JHRP-75-6 : 1975 : 95p 40refs
Prepared as part of an investigation conducted by the Joint
Hwy. Res. Proj. of Purdue Univ. in cooperation with the
Indiana State Hwy. Commission.
Availability: Corporate author

HS-016 860

FIELD OF VIEW DIRECTLY BEHIND LARGE TRUCKS AND BUSES

The blind area directly behind small trucks, multi-purpose vehicles, large trucks, and buses was investigated to determine the rear information the driver needs to reduce the accident risk for various driving situations. Accident data, drivers' evaluations of risk and information needs, and vehicle use patterns were utilized to determine that the blind area is most risky when: backing, turning (including lane changes, merges, entering and exiting expressways), slowing and stopping. Several state-of-the-art techniques have the potential to eliminate the blind area behind the various vehicles. Based on a survey of manufacturers' information and devices, a comparison was made between the alternative techniques. It was concluded that the utilization of an effective rear vision system would be beneficial for several of the vehicle types. The techniques that appeared most promising were TV systems, closing rate sensors (doppler radar), and proximity sensors (acoustic). The primary recommendation was to perform selected tests and demonstrations of readily available, existing systems on such vehicles and under such conditions as to supplement the system analysis of the study with experimental data.

by M. L. Reiss; H. Lunenfeld
BioTechnology, Inc., Falls Church, Va.; Federal Hwy.
Administration, Washington, D.C.
Contract Ref: DOT-HS-112-1-162-1
1975 : 29p 16refs

Presented at the 54th Annual Meeting of the Transportation
Res. Board, Washington, Jan 1975, based on a study
performed at AIL, a division of Cutler-Hammer.
Availability: BioTechnology Inc., 3027 Rosemary La., Falls
Church, Va.

HS-016 861

THE UTILIZATION OF A MOTORCYCLE ACCIDENT TYPOLOGY (OR WHO DID WHAT TO WHOM AND HOW)

The creation of a motorcycle accident data base during the performance of a study for the Motorcycle Safety Foundation is described. The objective of the study was to determine the status of motorcycle accident data, to determine accident causal factors, to identify voids in the data, and to suggest a basis for future improved educational and public information programs. A motorcycle accident typology was devised to identify accident categories for which specific countermeasures could be designed. On the basis of the distribution of 1,191 Maryland motorcycle accidents in 1973, 600 police accident reports were sampled in order to present the six most prevalent accident types. The utilization of this typology permitted the identification of accident culpability and of primary and secondary causation factors for each of the accident types. A primary product of the study was the identification of statistically significant differences between accident types on each of the 54 accident variables coded. The six types were accidents involving single or multiple vehicles, rural or urban conditions, and intersection or non-intersection locations.

by M. L. Reiss; W. G. Berger; G. R. Vallette
BioTechnology, Inc., 3027 Rosemary Lane, Falls Church, Va.
1975 : 20p 10refs
Presented at the 54th Annual meeting of the Transportation
Res. Board, Washington, Jan 1975.
Availability: Corporate author

SCHOOL TRIP SAFETY AND THE TRAFFIC ENGINEER

An analysis of school walking trip accidents with children under 15 years of age indicated that the 5-8 year-old group was overinvolved while the older age groups (10-14 years) were underinvolved. Field surveys were utilized to determine student and driver perceptions of traffic control devices. Significantly more of the younger students indicated that they were unaware of or did not discriminate between various traffic control devices; that they did relate to police or student crossing guards; and that they would vary their route to school on the basis of parental instructions. Drivers were not observant of school advance warning and crosswalk signs. In general, the only signs perceived were active signs with flashing lights. These did not necessarily modify driver behavior or reduce speed to the level indicated on the sign. Drivers indicated that student pedestrian safety in the school zone could best be increased by the presence of police and crossing guards. One promising technique appeared to be the "Safe School Walking Route Program". A walking trip map was prepared by traffic engineers and used by the parents and school to communicate with the students, as well as with each other.

by M. L. Reiss; H. D. Robertson
BioTechnology, Inc., 3027 Rosemary Lane, Falls Church, Va. 1975 ; 11p 11refs
Presented at the 54th Annual Meeting of the Inst. of Traffic Engineers, Seattle, Aug 1975.
Availability: Corporate author

HS-016 863

DIGITAL DATA ACQUISITION WITH EMPHASIS ON MEASURING PRESSURE SYNCHRONOUSLY WITH CRANK ANGLE

A general purpose data acquisition system has been developed which converts analog data to scaled, tabulated, and graphical output. A scanning synchronization unit ensures that each input channel is sampled synchronously with input data pulses. System input can be either direct from the test area or from an analog tape recorder, in which case time expansion is possible by the use of high record-low play back speeds. A computer program controls the analog to digital conversion process. The on-line control of the program minimized the subsequent data reduction, and through the use of input parameters, flexibility is attained in data formatting. The data reduction error is less than 1% and statistical programs included in the system provide estimates of the quality of the input data. The entire system including all associated hardware and software is described in detail, using acquisition of pressure data synchronously with crank angle as an example.

by R. V. Fisher; J. P. Macey
General Motors Corp., Res. Labs,
Rept. No. SAE-750028 ; 1975 ; 15p 15refs
Presented at the Automotive Engineering Congress and Exposition, Detroit, 24-28 Feb 1975.
Availability: SAE

INVESTIGATION OF ACCIDENT FREQUENCY AT HIGHWAY INTERSECTIONS AS INFLUENCED BY LIGHTING

Accident frequency for rural at-grade intersections was determined for three-year periods immediately before and after lighting. Results from 47 intersections revealed a 49% overall reduction in nighttime accidents after lighting. The average nighttime accident rate per million entering vehicles was 1.89 before and 0.91 after lighting, a reduction of 52%. It was determined that this improvement in the nighttime accident rate was a statistically significant reduction at the 99% level when compared to the before lighting night and after lighting day rates. Similar data are provided for groups of intersections relative to channelization, route turns, number of lanes, the number of lights, and average daily trips.

by F. W. Walker; S. E. Roberts
Iowa State Hwy. Commission, Ames, Iowa
1973 ; 20p 4refs
Presented at the 54th Annual Meeting of the Transportation Res. Board, Washington, Jan 1975.
Availability: Corporate author

HS-016 865

AFTER 30 MONTHS, WHAT HAVE WE LEARNED FROM MVSS 108?

The impact of Federal Motor Vehicle Safety Standard 108 on manufacturers and distributors of lamps, reflective devices and associated equipment used in heavy-duty vehicle lighting is discussed. Examples are given of state enforcement and user attitudes on compliance. The effects on manufacturers and distributors of their preparation for user compliance are stressed. The conclusion is that the supplier who fully understands forthcoming standard regulations and works with users to help them comply, as well as stocking compliance certified products, will have an initial marketing advantage over suppliers who ignore and are unprepared to comply with new standards.

Publ: Heavy Duty Fleet Distribution p17-9,22-3 (Sep 1974)
1974
Availability: See publication

HS-016 866

LIVING WITH DOT...(BUT NOT EXACTLY LOVING IT)

The impact of Federal Motor Vehicle Safety Standards 105 on distributors is discussed. This standard establishes performance criteria for hydraulic-braked vehicles. It specifies performance of the service and parking brake systems, antilock devices and associated equipment. It also specifies minimum stopping distances from various speeds, with a prescribed sequence of tests that must be followed. Due to the fact that only post-standard vehicles will be required to employ the new system, suppliers must stock both old and new parts. Interviews with two executives of the Bendix Heavy Vehicle Systems Group are presented, discussing the impact of the new standards on system design of not only brake related components but also of axle and suspension systems. Skid control devices and tests are specifically discussed, as

November 30, 1975

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well as the requirements for split braking systems (disc and drum brake combinations).

Publ: Heavy-Duty Fleet Distribution p9-13 (Sep 1974)

Availability: See publication

HS-016 867

A REVIEW OF DRIVER/RIDER TRAINING IN RELATION TO ROAD SAFETY

Educational and training programs for drivers and motorcycle riders are reviewed. It is pointed out that training programs can aim to improve the skill of the trainees, to provide background information relevant to the driving task, and to modify the attitudes of those to whom the program is directed. These separate objectives are rarely defined and clarified by those responsible for training programs offered to the driving public. Typically high school programs emphasize background knowledge relevant to driving; commercial driving courses, defensive and advanced driving. Training courses for professional drivers emphasize the improvement of skill. Modification of attitudes is the usual emphasis of publicity campaigns and is commonly attempted in driver improvement programs. Of the various methods reviewed, those courses which emphasize background knowledge appear to improve violation record but have no proven effect on accident involvement. Of those courses which aim to improve skill, defensive driving and courses of training for professional drivers, which employ essentially similar methods, have demonstrated an effectiveness in reducing both violations and accidents. Their success appears to be due to an emphasis on the perceptual, information-gathering aspects of the driving task, and they are therefore considered to be suitable for drivers who have already mastered the basic skills of operating a vehicle. They do not appear to be suitable for initial training. Of the methods reviewed only the use of television films to demonstrate to the public the type of errors made by drivers had a proven effect on accident involvement. The following conclusions are set out: pilot defensive driving courses in Australia are recommended; the possibility of developing a course and examination in safe driving principles for probationary drivers should be researched; television films demonstrating common driving errors and corrective procedures should be presented over local channels; more intensive research on driver education is needed; as no method of training new drivers has been shown to be significantly better, the method used should be the lowest cost one for the community.

by C. Cameron; W. A. Macdonald
Australian Road Res. Board
Rept. No. NR/1; 1973; 88p 121refs
Availability: Australian Dept. of Transport

HS-016 868

A REVIEW OF DRIVER/RIDER LICENSING IN RELATION TO ROAD SAFETY

Procedures for granting licenses to operate vehicles are reviewed under the main headings of age, competence and fitness. The conditions under which a license may be granted are considered in relation to the road accident situation, and the possible contribution of modified licensing procedures to the reduction of road accidents are evaluated. Also included is information extracted from published reports relating to the

licensing procedures of the States and Territories of Australia. The conclusions are the age at which a license may be obtained to drive a motor car or to ride a motor cycle should be not more than 17 years nor less than 16 years, as there is no evidence that drivers and riders of 16 years are any more liable to be involved in accidents than those of 17 or 18 years: there is no evidence that a maximum age at which a valid license may be held should be prescribed, as drivers of advanced age do not represent a serious risk to the community. There is an increase in accident risk in individual drivers aged 70 and over, on an exposure basis, but their contribution to the road accident total is small; there is evidence that the visual standards which are met at initial license testing are not maintained by a large population of drivers (deterioration of vision with age is almost universal) and, to the extent that impaired vision is associated with accidents, an improvement in road safety would be expected from measures to insure that uniform visual standards are maintained; compulsory medical examinations to insure physical fitness cannot be recommended, as the cost would be high and the benefit small (known medical conditions such as heart disease, alcoholism and epilepsy, should be regarded as grounds for medical certification before a license is granted, but any attempt to screen all applicants medically is likely to prove ineffective); license tests should include a stringent test of local traffic regulations, preferably in the form of a written objective test; critical evaluation of practical driving tests, and tests to examine knowledge of safe driving principles should be the subject of further research.

by C. Cameron; W. A. Macdonald
Australian Road Res. Board
Rept. No. NR/2; 1973; 72p 110refs
Availability: Australian Dept. of Transport

HS-016 869

A REVIEW OF ALCOHOL IN RELATION TO ROAD SAFETY

Alcohol contributes to about 50% of fatal accidents overall and to a higher proportion of those which occur at night and on weekends. Its contribution to injury and damage accidents is smaller but substantial. Detected drinking drivers, accident-involved or not, do not form a typical cross-section of the driving population. Among detected drinking drivers there is gross overrepresentation of males, blue-collar workers, and of individuals with convictions for serious traffic offenses, repeated drunk-driving offenses, criminal records, and blood alcohol content (BAC) exceeding .10. Current research suggests that drinkers can be separated into two main categories: responsible and excessive. The groups can be defined in quantitative terms based on alcohol intake. Excessive drinking is indicated by a daily average intake of about 10.7 oz. glasses of beer (or comparable amount of other alcohol forms), a BAC of .10 or more, or the intake of 10 beers on a single occasion. Responsible drinking is indicated by an average of 8 beers or less per day. Studies of community drinking habits show that less than 10% of males and a much smaller proportion of females would qualify as excessive drinkers. The majority of detected drinking drivers (and drinking pedestrians), whether accident victims or apprehended for driving offenses, qualify as excessive drinkers by having a BAC level in excess of .10. The drinking habits of detected drinking drivers bear close resemblance to those reported in the histories of alcoholics. Due to young age, the physical symptoms of the disease may not have appeared in many of these drivers, but a pattern of

excessive drinking may be well established. These excessive drinking drivers form a group with high risk of alcoholism and/or of accident involvement. Therefore the issue is raised as to whether punishment or rehabilitation should form the basis of a policy for dealing with them. Countermeasures to reduce drunk-driving accidents act in three areas: detection of drinking drivers; dealing with those who are detected; and education of the community at large about the use of alcohol and the risks of drinking and driving. The choice of countermeasure depend on whether drunk driving is regarded as a traffic or community health problem.

by A. E. Raymond
Australian Road Res. Board
Rept. No. NR/3; 1973; 126p refs
Availability: Australian Dept. of Transport

HS-016 870

A REVIEW OF LEGISLATION AND ENFORCEMENT IN RELATION TO ROAD SAFETY

Available literature on legislation and enforcement to alter the behavior of drivers was reviewed. Among the areas covered were: criminal liability in traffic accidents, accidents and traffic/driver behavior, the effectiveness of enforcement, the types of penalties used (fines, warnings, point systems, education techniques, imprisonment, revocation of license, and vehicle impoundment), and the special handling of "high risk groups" (young drivers and drunk drivers). Three main recommendations resulted from the review: that research be directed towards assessing the cost-effectiveness of the various penalties by designing experiments allowing for random allocation of different penalties amongst socially matched groups of offenders; that penalties should not be introduced or used without first conducting a pilot study to test the relative effectiveness of such penalties in changing the driving behavior of offenders; and that research efforts concentrate more on the effectiveness of penalties rather than on the effectiveness of enforcement, as enforcement appears to have a relatively low cost-effectiveness in reducing accidents, injuries and fatalities. The following recommendations were made concerning criminal liability: no better method of dealing with traffic offenses has been demonstrated than the application of ordinary principles of criminal liability; empirical research is suggested into the desirability of strict liability; an investigatory type system should not replace the current court system; punishment of offenders should be handled by the courts and not other officials with "roadside justice"; a jury trial is only appropriate in fatality cases involving intent; and research should be done to see whether trial speed is a factor affecting the deterrent efficacy of punishment. Regarding driver behavior, no test factors seemed to be associated strongly enough to allow practical screening of accident prone drivers. Since it appears that 30-60% of disqualified drivers continue to drive, a system of selective vehicle impoundment is suggested. Because most of the reckless drivers are in the young "high risk group", special penal measures and restrictions of vehicle use are suggested.

by P. G. Ward; G. D. Woods; P. Brennan
Sydney Univ., Inst. of Criminology, Sydney, Australia
Rept. No. NR/4; 1973; 84p 255refs
Availability: Australian Dept. of Transport

HS-016 871

A REVIEW OF EDUCATION AND PUBLICITY (IN RELATION TO ROAD SAFETY)

Relatively little research has been done in Australia to evaluate the effectiveness of numerous mass road safety campaigns in reducing accidents, injuries and fatalities. Most of the research currently available concentrates on the traffic accident as an event rather than inquiring into causal factors. A review of the state of knowledge outside of Australia reveals some objective research on traffic safety. The research indicates that media can be effective in reducing traffic accidents. Radio, television and newspapers are of prime importance. Radio being effective because it reaches the driver in the act of driving, television being effective, yet dependent on programming and amount of exposure of the televised message to various segments of the driver population, and newspapers being effective yet often overlooked, due to the apparent potency and immediacy of radio and television, as primary educative and informative sources for adults. Suitably designed films can be as effective as lecture methods in developing safety attitudes and in teaching mechanical skills. Safety posters or billboards have the advantage of presenting the message at the place where it is needed, yet are not likely to produce innovative responses or changes in habitual behavior. Leaflets have been shown to be effective forms of communication for specific kinds of messages. "Scare messages" that arouse fear have a debatable value. It has been shown that such messages can influence behavior and increase safety awareness, yet often will be avoided by the public because of the fear that they arouse, or will cause a retention of the more frightening or gory details, which, in turn, could be detrimental in attempting to cope with actual danger. One of the basic research needs is a study of driver motivation in relation to specific driving practices, particularly in young drivers and drinking drivers. The major problem discovered in the literature reviewed is that there is no priority of practices in driving, in terms of their contribution to road safety.

by J. W. Thompson
J. Walter Thompson (Aust.) Pty. Ltd., Australia
Rept. No. NR/6; 1973; 176p 111refs
Sponsored by Australian Dept. of Transport.
Availability: Australian Dept. of Transport

HS-016 872

A REVIEW OF VEHICLE DESIGN TO REDUCE ACCIDENTS IN RELATION TO ROAD SAFETY

Literature which explores known likely, or implied relationships between vehicle design and accidents is reviewed. In designs to reduce accidents, emphasis is given to: the need for vehicles to be designed with consideration of the anthropometric dimensions of different drivers; the effect on vehicle design of traffic, road, and environmental conditions; the extent to which other constraints on designers, such as styling, affect the incorporation of safety features; and the practicability of the application of these improvements to vehicles already on the road. Aspects of vehicle design considered were: handling and stability including steering, suspension, brakes, anti-skid systems, and dimensional aspects, such as center of gravity, track, wheelbase, ground clearance and turning radius; tires and wheels; lighting systems (for seeing and being seen); the use of reflective material; signalling and other warning systems; the use of radio communication; improvement in driver field of view; the placement and operation of controls

and instrument displays; the operation of comfort features and climate controls; special problems such as jack-knifing; vehicle performance while towing; accelerating and climbing performance in trucks and buses; securing of loads; and automated devices. Applicable aspects are also considered regarding motorcycles and bicycles. The following recommendations emerged: fitting anti-skid devices to all motor vehicles; compulsory tire replacement when tread depth reaches $1/16''$; improving vehicle visibility by using daytime running lights, light paint colors and reflectorized surfaces; fitting efficient mud flaps on all wheels of a vehicle; legislating a power limit on vehicles operated by young drivers; and the introduction of minimum speed limits on freeways. Further studies are also recommended in the following areas: reflective surfaces, paint colors, tire design, braking requirements, anti-lock systems, driver field of view, steering and handling, and ergonomics.

by E. R. Hoffman
University of Melbourne, Dept. of Mechanical Engineering,
Australia
Rept. No. NR/7 : 1973 ; 178p refs
Sponsored by the Australian Dept. of Transport.
Availability: Australian Dept. of Transport

HS-016 873

A REVIEW OF VEHICLE DESIGN (INJURY REDUCTION) IN RELATION TO ROAD SAFETY

The search for criteria, which can be applied to design standards for motor vehicles and that will result in a reduction in the number and severity of accident injuries, has led to an examination of such inter-related factors as: the tolerance levels of the human body to deceleration impact forces; the frequency and type of occupant injuries and the relative severity of these injuries; the relationship between injuries and the various vehicle features leading to these injuries; and the transmission of impact forces through the vehicle to the occupants. It was found that tolerance levels were not uniformly established, especially regarding the effects of off-axis or multi-directional impacts. Current developments in vehicle safety design in relation to injury reduction are more advanced for passenger cars than for trucks and buses. It is apparent that safety for truck occupants would be increased by the application of known principles of crash protection, such as anti-burst door locks, energy absorbing steering columns, and padding, as well as improved structural integrity of truck cabins. The most effective result in protecting motor vehicle occupants appears to be achievable through a two fold approach: the design of the vehicle to insure the structural integrity of the passenger compartment in a crash; and design of passenger restraints to avoid secondary impact. The review of published material has shown the lack of information on assessing the cost effectiveness of measures undertaken to reduce injuries. The main conclusions concerning items requiring implementation were: the use and improvement of existing seat belt systems; the development of an integrated seat with inertia reel restraints; and the use of high penetration resistance laminated glass for windshields. The need for additional research was indicated related to human impact tolerance, the cause and frequency of occupant injuries, the cost of safety features, occupant compartment integrity, and pedestrian safety. Cost/benefit studies are needed regarding

truck body integrity improvements and restraint systems for trucks and buses.

Traffic Planning and Res. Pty. Ltd., AUSTRALIA
Rept. No. NR/8 : 1973 ; 148p 77refs
Australian Dept. of Transport. Cover title: A Review of Vehicle Design to Reduce Injuries in Relation to Road Safety.
Availability: Australian Dept. of Transport

HS-016 874

A REVIEW OF VEHICLE INSPECTION IN RELATION TO ROAD SAFETY

Literature is reviewed dealing with inspection policies and techniques. The various inspection schemes used are reviewed: on-the-spot random checks; selective checks based on vehicle or owner characteristics; checks following major repairs; checks upon change of ownership; and periodic compulsory inspection. Statistical evidence is presented on the number and type of defects found on vehicles in use. The extent to which particular defects contribute to accidents is also explored. The various inspection schemes are compared in terms of their ability to detect accident related defects. Component performance standards and test methods are discussed, specifically as regards brakes, headlights, taillights, and steering gear. Personnel and test equipment requirements, as well as the testing authority are discussed.

by L. A. Foldvary
Rept. No. NR/9 : 1973 ; 170p 129refs
Sponsored by Australian Dept. of Transport
Availability: Australian Dept. of Transport

HS-016 875

A REVIEW OF RAILWAY LEVEL CROSSINGS IN RELATION TO ROAD SAFETY

Literature was reviewed to assist in establishing the reduction in accidents, injuries, and fatalities which could be expected in Australia from the provision of appropriate protection systems at level crossings in urban and non-urban situations. The review identified the major problem in establishing the likely reduction in accidents as the determination of the type of protection device which is appropriate for provision at a particular level crossing. There can be no doubt that the installation of active protection systems at railway crossings will reduce the occurrence of accidents at the crossings after installation by up to 90%. The nature of protective systems is reviewed extensively, as well as reports of the effectiveness and costs of these systems. The various methods, generally known as hazard indices, to determine the crossings which should be protected and the nature of protection to be provided are examined. It was not possible to carry out a hazard index analysis for Australian conditions, because there was no published data available describing the nature of railway crossings in Australia or of the road and train traffic flows across them. Neither the number of the various types of protection systems which could be installed, nor the number of accidents likely to be prevented by these installations could be determined. Railway crossing protection systems can be classified under 5 headings: systems to eliminate crossings; active warning and protection systems; passive warning systems; improvements to vehicle or train design, and improvements in visibility at crossings. Although most crossing accidents do not involve

HS-016 876

a train, in train involved accidents the risk of death is much greater.

by K. W. Ogden; T. A. Patton; N. Clark
Monash Univ., Dept. of Civil Engineering; Univ. of
Melbourne, Dept. of Civil Engineering, Melbourne, Australia
Rept. No. NR/10; 1973; 123p 29 refs
Sponsored by Australian Dept. of Transport On cover: A
Review of Railway Crossing in Relation to Road Safety.
Availability: Australian Dept. of Transport

HS-016 876

A REVIEW OF ROAD DESIGN IN RELATION TO ROAD SAFETY

Available literature on the subject of road design was reviewed. The study was conducted in relation to several basic propositions: that the design of the road affects the accident rate, as it directly affects the way in which vehicles move along it (includes design consideration of visibility, intersections, median openings and gutter crossings); and that road design plays an important part in the amelioration of accidents, with emphasis on the construction of suitable energy absorbing structures to stop the vehicle and reduce accident severity. Specific areas discussed were geometrics, road surface (including certain accident prevention features such as rumble strips), road structures (including medians and bridges), intersections, and control of access and vehicle features. Also discussed were the costs of road design, construction and maintenance, and the cost effectiveness of various road facilities. The main conclusions drawn from the literature have been grouped as general road design aspects, factors related to at-grade roads, factors related to grade separation facilities, factors related to off-road accidents, technical research work recommended and research items related to benefit/cost assessment of improvement projects. Road design recommendations were to minimize the number of intersections and changes in road geometry; to increase road and shoulder width; to provide adequate road water drainage; to maintain a high co-efficient of friction of the pavement; and to use rumble strips where road conditions change. At-grade road recommendations included maximizing highway access controls and median usage; road reconstruction by easing curves, widening bridges and increasing visibility; increasing the use of T-intersections; concentrating traffic streams on main roads; providing separate median lanes for turning traffic; and using curve delineation devices. Diamond shaped access patterns at interchanges are recommended, as well as 800' long acceleration/deceleration freeway lanes. Other recommendation concerned the use of traversible medians, guard rails, various crash barriers, and the use of breakaway light and sign support.

Sinclair, Knight and Partners Pty. Ltd., Australia
Rept. No. NR/11; 1973; 136p 112 refs
Sponsored by Australian Dept. of Transport.
Availability: Australian Dept. of Transport

HS-016 877

A REVIEW OF ROADSIDE OBJECTS IN RELATION TO ROAD SAFETY

Available literature on the subject of potentially hazardous roadside object is reviewed. Wherever sufficient information was available, cost effectiveness of remedial measures were

HSL 75-11

made. In an attempt to maximize the benefit of this study, several lines of approach have been followed. The first was to establish from road, traffic and accident statistics the dimensions of the problem: the road mileage and vehicle mileage for various functional classes of road; the numbers and distribution of various roadside objects on these roads; the types of object struck and the frequency and severity of these collisions; and the effect on these statistics of the type of highway, road geometry, traffic volume, and visibility conditions. The second approach was to define the appropriate engineering measures which might be applied to each roadside object. Finally, an extensive review was made of full-scale crash testing and development work from which the effectiveness of measures might be inferred. Due to a lack of sufficient and conclusive information, a systematic tabulation of accident and fatality reduction and a meaningful cost effectiveness analysis could not be accomplished. Accident statistics were examined for Australia, the United States, Great Britain and New Zealand. The principal objects considered in this study are: street light supports, utility poles, signal and sign supports, road delineation markers, edge striping, guardrails, median barriers, impact-attenuation and vehicle-arresting devices, curbs, safety zones and islands, traffic circles, safety bars and rumble strips, glare screening, bridge abutments, supports and parapets, parked vehicles, construction equipment, trees and hedges, drainage structures, cliffs, embankments, and railway barriers.

by M. C. Good; P. N. Joubert
Univ. of Melbourne, Dept. of Mechanical Engineering,
Melbourne, Australia
Rept. No. NR/12; 1973; 292p 427 refs
Sponsored by Australian Dept. of Transport.
Availability: Australian Dept. of Transport.

HS-016 878

A REVIEW OF TRAFFIC CONTROL DEVICES IN RELATION TO ROAD SAFETY

Available literature on the subject of the use and effectiveness of traffic control devices is reviewed. These devices are defined as those used to regulate traffic flow and road user behavior with the exception of those used for speed control, railway crossings and pedestrian safety, which are treated in other reviews. The nature and purposes of traffic control devices are introduced. Regulatory devices are often used for the dual purpose of reducing accidents and improving operational conditions for vehicles and pedestrians. Ten types of control devices are examined: traffic control signals, flashing traffic signals, stop signs, yield signs, medians and separators, intersection lane control signs including circles, pedestrian safety devices, pavement markings, traffic management techniques (one way streets, reversible lanes, and turn controls), and parking restrictions. Overall, it is concluded that there is insufficient evidence to determine the extent that the installation of traffic control devices would reduce the number of accidents on the road system as a whole. It is clear, however, that the installation of specific devices according to scientifically determined conditions will almost always reduce accidents at that location. There is evidence that the installation of devices will actually increase the number of some types of accidents in certain circumstances. Because of the unresolved question about the overall effect of device installation on the road system, it is recommended that a program of studies be commenced in Australia of the effectiveness of schemes of traffic management in promoting road safety in

both urban and rural areas. Other recommendations call for the establishment of a central road accident information clearinghouse; the review of cost effectiveness techniques; the establishment of criteria for the installation and removal of traffic control devices; and for the research and improvement of the 10 types of traffic control devices along with their cost effectiveness.

by N. Clark; K. W. Ogden
Univ. of Melbourne, Dept. of Civil Engineering; Monash
Univ., Dept. of Civil Engineering, Australia
Rept. No. NR/13; 1973; 190p 106refs
Sponsored by Australian Dept. of Transport.
Availability: Australian Dept. of Transport

HS-016 879

A REVIEW OF NON-REGULATORY SIGNS IN RELATION TO ROAD SAFETY

A review was conducted of Australian and other research and practice covering the effect of non-regulatory road signs and markings on road safety. Results are presented and conclusions drawn to the effect that large statistically significant reductions in accident frequency in Australia could be obtained by the following: installing advisory speed signs on curves on rural roads; painting edge lines on rural roads; erecting post mounted reflectorized delineators on rural roads; painting medians and lane lines on urban roads; painting lines across minor roads at junctions with major roads; and installing flashing warning devices at rural intersections. Because some of these countermeasures are already incorporated into the policies of most state road authorities the actual benefits which could be expected depend on the remaining scope for their further application. Some safety benefit/cost ratios and cost/effectiveness calculations for the various countermeasures are given but owing to the lack of precision used in their derivation it is concluded that they are not reliable and not necessarily applicable to Australian conditions.

by K. A. May; J. Wooller
Swinburne Coll. of Technology, Dept. of Mechanical
Engineering, Australia
Rept. No. NR/14; 1973; 45p 27refs
Sponsored by Australian Dept. of Transport.
Availability: Australian Dept. of Transport

HS-016 880

A REVIEW OF INTERSECTION PRIORITY IN RELATION TO ROAD SAFETY

A review was made of the way in which various intersection priority rules affect accident rates at intersections; and oriented around the proposition that an alternative rule to the existing give-way-to-the-right rule in Australia would lower accident rates. The following points were covered: the operation of various right-of-way rules, the occurrence of intransitive situations, the extent to which each priority system creates uncertainty in the minds of road users, the misinterpretation of priority rules by drivers, the requirements associated with each system for traffic control devices, the relationship of each system to the presentation of advisory information to the driver/rider, the appropriateness of each priority system to different street patterns, the safety of pedestrians, the capacity of intersections and arterial streets, and the effect of legal interpretations of "right-of-way" and "giving-way". In spite of

an extensive search for literature on these topics, it was generally found that there is little information available which is useful or sufficient to definitely state that any particular priority rule will or will not result in the lowest accident figures. Other conclusions are that: since the accident rate and accident severity at urban and rural intersections is different, and changes in intersection control by signposting should be considered individually; a comprehensive program of signposting of intersections would require the continuing of the existing right hand rule until all signs were posted; when the majority of intersections are signposted the priority rule is seldom invoked; and while there is a drop in the accident rate after signposting at individual intersections, there is no evidence that a complete priority system would result in an overall lower accident rate. Because of the lack of evidence related to the priority rule, three research programs are recommended to attempt to give some of the evidence needed for making decisions on the priority rule: the use of a computer to simulate traffic at intersections; testing of the priority road system under various conditions; and study of the accident rates at road system tests to confirm accident reduction figures given in U. S. literature.

Sinclair, Knight and Partners Pty. Ltd., Australia
Rept. No. NR/15; 1973; 53p 22refs
Sponsored by Australian Dept. of Transport.
Availability: Australian Dept. of Transport

HS-016 881

A REVIEW OF SPEED CONTROL IN RELATION TO ROAD SAFETY

Available literature is reviewed in an attempt to determine the effect of various speed control measures on the reduction of accidents, injuries and fatalities. Interactions among the major elements of the road transport system are discussed, i.e. the driver, the vehicle and the road-traffic system, in terms of their interaction with varying rates of speed. The observed relationship between speed and road accidents are presented and discussed in terms of the initial analysis of the road transport system. From this, the question of speed control is considered and the basic principles underlying various methods of speed regulation and control are discussed. The various speed control measures being used are analyzed along with an indication of the benefits which might be expected from their implementation. The measures discussed are: speed limits, advisory speed signs, pavement devices, vehicle devices, signal systems, and traffic control. These expected benefits are then weighed against the various costs involved in implementation. This review and analysis led to the identification of several major points: speed should be limited in relation to road conditions and traffic flow; most accidents are the result of cars going slower or faster than the flow of traffic; accident severity increases directly with speed; the objective of speed control is to reduce the variance of speed in the traffic stream; maximum speed limits may significantly reduce accidents, especially in rural areas; speed zones and absolute maximum speed limits are more effective than *prima facie* speed limits; advisory speed signs are effective for speed reduction on curves and for hazards; transverse rumble strips and speed bumps are effective; vehicle speed limiting devices would eliminate high speed traffic variance; co-ordinated traffic signals would be effective in the reduction of rear-end collisions; there is a need for night speed limits; and lanes for acceleration, deceleration, and climbing are also effective in reducing accidents. The level of enforcement, however, plays a large role in the effective-

ness of any speed control measure. It was found that no long term effectiveness studies have been done and insufficient information makes benefit/cost analysis meaningless.

by R. W. Cumming; P. G. Croft
Monash Univ., Australia
Rept. No. NR/16; 1973; 134p 101refs
Sponsored by Australian Dept. of Transport
Availability: Australian Dept. of Transport

HS-016 882

REVIEW OF TOWN PLANNING IN RELATION TO ROAD SAFETY

Literature concerning the influences which various aspects of urban planning have on traffic control and safety are reviewed. Three major topics are dealt with: urban planning and development control, traffic management and planning, and changes to existing urban areas. The application of urban planning and design principles to the layout of new communities can reduce accidents by minimizing the potential for vehicle-vehicle and vehicle-pedestrian conflicts. The need to integrate road, pedestrian, and land use planning emerges strongly. Traffic management and planning was discussed in terms of parking controls, public transportation, one-way street utilization, volume restrictions on traffic in areas, and full or partial bans on types of vehicles in areas. Changes to existing urban areas centers around the redesign of intersections to reduce access, and the modification of streets to create pedestrian malls and concourses. On the basis of the investigations reported, the following measures could result in a significant reduction of accidents: control of access points from minor streets on to adjacent main roads; the avoidance of cross-intersections of minor roads; peak hour on-street parking bans; and conversion of selected streets in central areas to one-way operation. Additional measures may have some beneficial effect on road safety, including the planning and provision of a comprehensive freeway and arterial road system; horizontal and vertical separation of pedestrians in the planning of new residential and commercial areas; the use of intersection diverters and median strips to reduce conflicting movements and through traffic in existing residential areas; the conversion of major-minor cross-intersections to T junctions with the fourth leg terminated as a cul-de-sac; and the closure of selected streets, either for part of the day or permanently, in congested commercial areas.

Loder and Bayly, Australia
Rept. No. NR/17; 1973; 144p 87refs
Sponsored by Australian Dept. of Transport
Availability: Australian Dept. of Transport

HS-016 883

A REVIEW OF STREET LIGHTING IN RELATION TO ROAD SAFETY

There is a wealth of data, world wide, showing that a disproportionate of road accidents occur at night. Typically, an Australian study showed that 42% of all casualty accidents and 60% of all fatal accidents occurred at night, in spite of the fact that only 20 to 25% of all traffic miles were travelled at night. Not only are accidents more frequent at night but also they are more severe. Pedestrians are four times more likely to be killed in a night accident than a day accident. While some of the increase in the night accident rate can be attributed to dif-

ferent traffic flows and road user behavior patterns, the main reason for it is darkness. Basic psycho-physical data and analytical investigations suggest that only a moderate increase in light level, from darkness, but without appreciable glare, will ensure good visual task performance. This can easily be achieved through the use of street lights. One before and after study showed that good lighting reduced the night casualty accident rate by 30%. Another study showed a reduction of all night accidents by 40% and of all injury accidents by 50%. An analysis of national codes of practice show that a good deal of agreement exists between countries on lighting requirements. Most countries have a multi level requirement in that as the road importance increases so does the light level. Cost-benefit studies suggest that the cost of lighting may be recouped from savings in accident costs. Ordinary urban roads with mixed road user populations may be economically lit if the daily flow is over about 3,500 vehicles. It is suggested that highways could be economically lit if the daily flow is over 12,000 vehicles.

by A. Fisher
University of N.S.W., School of Transportation and Traffic,
Australia
Rept. No. NR/18; 1973; 117p 87 refs
Sponsored by the Australian Dept. of Transport
Availability: Australian Dept. of Transport

HS-016 884

A REVIEW OF PEDESTRIANS, PEDACYCLISTS [BICYCLISTS] AND MOTORCYCLISTS IN RELATION TO ROAD SAFETY

A review of the available Australian and overseas literature on pedestrian safety is described, as well as the results of an original study which has not yet been reported. The latter deals with the characteristic features of pedestrian accidents and casualties based on exposure. Measures to improve the safety of pedestrians that are discussed involve: road surface material; controlled and uncontrolled pedestrian crossings; school crossings; special crossings (at sports arenas or for the handicapped); integration of pedestrian protection measures with traffic control and safety measures; legal measures for pedestrian protection; pedestrian refuges, islands, median strips, and switch-back fencing; provision of completely segregated pedestrian routes; footways, pedestrian reserves, cleared roadside verges in urban and rural areas; pedestrian areas in town centers; barriers to prevent crossing the road; siting and design of public transport routes, stops, and interchanges; and subways and overpasses. Most means of improving pedestrian protection are based on the separation of pedestrian and vehicular traffic. Bicycle safety is reviewed, and bicycle accident factors are discussed and tabulated, including such factors as time of day, day of week, weather conditions, type of location, type of vehicle involved, light conditions, whether at or not at an intersection, whether in an urban or rural area, and age and sex of cyclist. Motorcycle safety is also reviewed, and the characteristics of motorcycle accidents are tabulated according to same factors as given for bicycle accidents. Safety measures are suggested for both bicyclists and motorcyclists, with emphasis on bright colored clothing, reflective devices, and the protection of the head and lower limbs.

by L. A. Foldvary
Rept. No. NR/19; 1973; 346p 217refs
Sponsored by the Australian Dept. of Transport
Availability: Australian Dept. of Transport

HS-016 885

A REVIEW OF THE ROLE OF ORGANISATIONS [ORGANIZATIONS] IN RELATION TO ROAD SAFETY

A review was made of the present organizations directly or indirectly concerned with road safety. There are considerable number of organizations, authorities, committees and institutions at a national, or state level who are concerned with various facts of road safety and in addition a number of authorities which influence road safety through the policies adopted within their areas of responsibility. A tabulation is provided which examines these organizations within the State, Territory, National and Commonwealth level in Australia. These organizations include both government agencies, private organizations, and professional associations. The prime conclusion stemming from this review is that, because road safety is a national problem, a co-ordinated national effort is required to modify the current road safety environment. Specifically, there is a need for an authority at Commonwealth level to: define the problems requiring solution; assign priorities and to organize and co-ordinate the necessary research; prepare national standards and policies; and ensure implementation at the Commonwealth, State, and local level. This national authority would operate in connection with local comparable agencies.

Traffic Planning and Res. Pty. Ltd., Australia
Rept. No. NR/20; 1973; 149p
Sponsored by Australian Dept. of transport.
Availability: Australian Dept. of Transport

HS-016 886

A REVIEW OF MASS DATA IN RELATION TO ROAD SAFETY

An investigation was made into the value of data concerning drivers, vehicles, and environmental conditions involved in accidents, in order to allow determination of the significant factors which, by incorporation into regulations, standards or advisory information, could be expected to reduce the incidence and severity of accidents. Socio-economic factors, though difficult to control directly by legislation, are legislation, are important considerations in understanding the accident problem. The conclusion was reached that certain items of information should be collected by police accident investigations, as routine accident data, these items include: the driver's response condition; vehicle data (including the condition of steering, brakes and lights, and the speed, compartment integrity and general damage of the vehicle); the cause and severity of injury, as well as location of occupants and restraints used; and the road environment. Another type of data useful in safety research would be collected by sampling, using non-police personnel, these include such information as: the driver's experience, education, physical or psychological defects; the types of vehicle components and post-crash condition; road characteristics; and medical services used. Also recommended are the following: an investigation of the availability of uniform data concerning driver and vehicle tests and injury classification; research into collector performance and methods for identifying accident location; a review of latent requirements for special studies involving sampled data, to determine sampling schedules; and the collection of mass data

from non-accident situation, to provide a control for significance tests.

Traffic Planning and Res. Pty. Ltd., Australia
Rept. No. NR/21; 1973; 62p 12refs
Australian Dept. of Transport.
Availability: Australian Dept. of Transport

HS-016 887

A REVIEW OF IN-DEPTH STUDIES IN RELATION TO ROAD SAFETY [ACCIDENT STUDIES]

Attempts at the prevention and control of road accidents are most likely to be successful if they are based on a clear understanding of the nature of the problems involved. An adequate data base is necessary if such an understanding is to be achieved. The role of in-depth studies of road accidents is to provide essential information that cannot be obtained in any other way. The investigation of road accidents at the scene by a team of investigators, each qualified to conduct research in a relevant discipline, has been taken as the typical in-depth study. The publications reviewed are grouped according to the research unit in which the author conducted his investigations, and these groups appear in chronological order. The emphasis in this review is on the methodology of in-depth studies, and findings and conclusions are mentioned only when they appear to be soundly based or when they illustrate some issue relevant to the conduct of this type of study. The major recommendations for future work in this field in Australia are that in-depth study of rural accidents, and a number of controlled studies of specific aspects of accidents, be initiated as soon as is practicable. The rural accident study should be conducted at various levels, using data obtained from investigations at the scene of accidents, from studies initiated at the scene of accidents, from studies initiated on the day after the accident, and from routinely recorded mass data. The controlled studies, of considerably smaller scope that the rural study, should incentive of the total economy.

Sponsored by Australian Dept. of Transport
Availability: Australian Dept. of Transport

HS-016 888

A REVIEW OF THE COST OF ACCIDENT IN RELATION TO ROAD SAFETY

A particularly narrow view of the economic loss through death was taken, for the purposes of estimates, to determine the cost of accidents in Australia. Persons killed were viewed simply as economic machines. The loss to society was taken as their expected future net economic contribution to society, capitalized at 5%. The policy implications of this approach must be stressed. The cost estimates derived are minimal costs given the present institutional arrangements. Society would obviously place a far higher value on lives saved. The analysis assumes a two-stage approach to deciding on optimal spending for collision management. First, if the expenditure of a dollar can reduce the capitalized value of future expected collision costs by one dollar or more, then that expenditure is completely justified in rigorous economic terms. A calculation of this sort indicates the minimum justifiable commitment of resources to collision costs mitigated. Second, it is a matter for political judgement to decide on the value to be placed on

a modification of the existing environment and consequent reduction in death and injury over and above strict economic values. The study gives a rough indication of the order of actual costs incurred through road accidents in 1696, and sets it in the perspective of the total economy.

by J. Paterson
Urban Systems Pty. Ltd., Australia
Rept. No. NR/23; 1973; 144p 108refs
Sponsored by Australian Dept. of Transport. On cover: A Review of the Cost of Road Accidents.
Availability: Australian Dept. of Transport

HS-016 889

A REVIEW OF EMERGENCY MEDICAL SERVICES IN RELATION TO ROAD SAFETY (PTS. 1 AND 2)

Emergency medical services (EMS) are reviewed, specifically regarding the operations of ambulance services in relation to road accidents and injuries; and covering the operations of other persons and agencies in relation to accidents and including air transport. The following is a summary of findings. Although calls to traffic accidents make up 50% of all emergency calls to ambulance services, emergency calls from only 10-20% of all trips. The hospital casualty department should be included in the EMS, as there is a discontinuity in communications between hospital and ambulance service which has serve implications for patient care and welfare. There is very little published on training, equipment and organization of Australian ambulance services. However, the data that are available indicate that these areas are at least as good as in other countries. There is a need for a national inventory of ambulance services with a view to establishing the current state of ambulance services, and also to assess the performance of ambulance services by measuring outcomes in terms of fatality indices and distributions of response time. A National Center for Emergency Services should be established to act as a coordinating body. The life saving potential of ambulance services as presently constituted is estimated as being less than 5% of all road deaths. There is a need for an intensive evaluation of the EMS with an aim of establishing the objectives of the system and evaluating various alternative methods of improving the performance of the system. Organizations and persons outside the regular ambulance services do not appear to hold any great potential for playing a greater part. The instruction of large numbers of persons in elementary first aid does not appear too practical. The role of the police, fire services and tow truck drivers appears to be marginal in the provision of medical care, but their effectiveness could be increased with first aid training. The effectiveness of air over ground transport increases with distance from hospital. Computer applications were found to have potential in future EMS operation.

by G. A. Ryan; P. D. Clark; S. S. Lazarus
Rept. No. NR/24; 1973; 142p 114refs
Sponsored by Australian Dept. of Transport.
Availability: Australian Dept. of Transport

HS-016 890

A REVIEW OF INSURANCE IN RELATION TO ROAD SAFETY

The motor insurance system in Australia is examined. The compulsory third party insurance system is seen to have many disadvantages, and to be very costly to operate, primarily

because of the legal costs involved. Other administrative costs of this system are low and premiums have generally been held to a minimum or even unprofitable rate. The comprehensive insurance system is then examined. It is found to involve a complex premium rating system including an elaborate "merit-rating" system depending on claims experience. Overseas (non-Australian) research, developments and proposals are also discussed. It is found that most overseas research tends to treat insurance as a compensatory process which has little connection with road safety. Particular attention is given to recent American development and proposals and it is noted that the Massachusetts scheme has led to a reduction in insurance costs of more than 40% (no-fault insurance). The New Zealand Accident Compensation Bill is also discussed. Possible effect of different types of insurance on road safety are examined. The possibility of a premium rating structure for personal injury insurance is explored. While consideration is given to the theory of accident-proneness, which is the main justification for the "merit-rating" system, it was found to be an inconclusive factor. It is concluded that complexity and additional cost of premium rating by personal characteristics would outweigh any benefits, although insurance loading on drivers under 25 would be justified. The effects on road safety of first party and third party insurance are compared. It is concluded that the differences are not very significant for road safety purposes. The same conclusion is arrived at in discussing owner or driver insurance and the effects of insurance systems on other parties such as employers, parents and pedestrians. As regards automobile manufacturers and the liquor industry, there would be more significance in an insurance system which enabled a levy to be imposed on them. The cost of different insurance systems was examined and it was concluded that the best schemes were those abolishing the tort remedy, both for personal injury and property damage cases.

by P. S. Atiyah
Australian National Univ.
Rept. No. NR/25; 1973; 249p 72refs
Availability: Australian Dept. of Transport

HS-016 891

MECHANICAL PROPERTIES OF AN OFF-THE-ROAD TIRE

Four 20.5-25/16 PR off-the-road tires have been tested in order to obtain their static and dynamic properties. Quasi-static tests were performed to obtain static spring rates and loss energies. Drop tests were conducted with various weights and tire inflation pressures to obtain dynamic spring rates and damping coefficients. Dynamometer tests were performed at various loads, speeds, and inflation pressures in order to determine temperature buildup. Yawed roll tests are reported that provide carpet plots of cornering force and aligning torque versus slip angle and normal load. The following conclusions were drawn from the test results: static radial spring rates for both the bias and radial tire increase with inflation pressure; the average radial spring rate for both 40 and 60 psi is higher for the bias tire than the radial; the energy loss during radial load-deflection increases with inflation pressure and is higher in the bias tire than in the radial; for most cases dynamic spring rate increases and damping coefficient decreases with increasing inflation pressure; the damping coefficient is greater in the bias than in the radial tire; loss energy is greater in the dynamic case than in the static case higher temperatures are reached for higher speeds, higher loads, and lower inflation pressures;

the radial tire is cooler than the bias tire; for a given tire and inflation pressure, horizontal tire reaction is independent of radial load for loads below those resulting in slip (at zero yaw and camber); horizontal spring rates increase with increasing pressure; circumferential spring rates are higher in the bias tire than in the radial, while axial spring rates are higher in the radial tire; effective coefficient of friction is largely independent of radial load, inflation pressure, and whether bias or radial; axial coefficient of friction is higher than circumferential; cornering force increases with inflation pressure; aligning torque decreases with increasing inflation pressure; and cornering force is higher in the radial tire than in the bias, while aligning torque is higher in the bias tire.

by P. Skele; B. J. Brookman, Jr.
 Publ: Tire Science and Technology v3 n2 p95-110 (May 1975)
 1975; 6refs
 Presented at the American Society for Testing and Materials
 Com. F-9 on Tires Symposium on Off-the-Road Tire
 Performance and Cornering Characteristics of On-Road Tires,
 Akron, Ohio, 13 Nov 1974.
 Availability: See publication

HS-016 892

STRESSES AND STRAINS IN TIRES

Stress and strain patterns developed in each of several regions of tires have been mapped by using methods particularly suited to each region. Miniature force transducers were used to measure: the cord stresses due to shaping tires during vulcanization; the change in cord stress patterns caused by postinflation; and the cord loads caused by tire inflation and by cornering. Liquid metal gases were used to measure rubber strains on tire surfaces. A photoelastic method was used to measure the strain distribution interior to the tire under simulated load. In each of these procedures, particular attention was given to the differences in properties among bias, belted bias, and radial ply tires. The cord force transducers revealed that during cure the cord forces at the shoulder, due to shaping into the mold, are greater for the belted bias than for the radial, but the rise in cord force due to cord shrinkage during cure is greater in the radial tire. The cord forces in the inner-most body ply due to inflation pressure are greater in the belted bias than in the radial tire. The cord load amplitude in the belt plies of radial tires increases with slip angle (cornering) and the cords go into compression during cornering. This compressive force can result in a reduction of the fatigue life of the cord. The liquid metal strain gages show that in the sidewall region the strains in the radial tire are much larger than those in the bias ply tire. The increase in radial tire stiffness resulting from the addition of the belt in the tread region is reflected in the decreased strain magnitudes measured in the crown of the tire. The photoelastic coating test results showed that the distribution of maximum shearing strain through the tire thickness is nonlinear, with the largest value measured at the edge of the stabilizer ply.

by M. L. Janssen; J. D. Walter
 Publ: Tire Science and Technology v3 n2 p67-81 (May 1975)
 1975; 13refs
 Presented to the Akron Rubber Group, Akron, Ohio, 26 Jan 1973.
 Availability: See publication

HS-016 893

EFFECTS OF ALCOHOL ON DRIVING SKILLS. FINAL REPORT

Tests of sensory, perceptual and motor skills were carried out using both driving simulator and actual road tests. The first test was a simulator study of steering performance involving 12 men and 8 women; the second, with 4 men and 2 women (ages 21-30 years) was a driving simulator study of car-following performance; and the third was a car driving study using 23 men and 17 women (ages 19-56 years). Alcohol doses of up to 0.10% blood alcohol concentration (BAC) were used in these tests. The results showed that there were reductions in the left and right lateral horizontal visual fields of red stimuli; mesopic compatibility was decreased in a reaction time test; and there was a reduction in pursuit tracking ability. The lateral control driving simulator studies showed that drivers changed the cue structure which they used by emphasizing lateral position cues, with a reduction in emphasis on heading angle and yaw rate cues. The drivers under alcohol reduced their responsiveness in manipulation of the steering wheel. The effect was an increase in lateral position and heading angle errors. The effects of the alcohol doses used on the car-following task were less clear. However, spectral analysis indicated that headway errors were greater under alcohol when the frequencies of changes in lead vehicle velocity were above 0.06 Hz. Below this frequency there were no detrimental effects of alcohol. No effects on lateral path error were found in the car driving study. However, speed maintenance and variability in headway were greater in car-following, which confirms the preliminary findings obtained in the car-following driving tests. There were no significant effects in judgement of the speed of overtaking vehicles, seen in rearview mirrors or in passing gap judgements with respect to oncoming vehicles. It was concluded that the effect of alcohol was to change the cue structure utilized by the driver for lateral control, as well as his responsiveness with the steering wheel, to reduce his effectiveness. This reduction in performance could be expected to lead to an increase in single-vehicle, loss-of-control crashes. The car-following tests suggest that drivers at moderate doses of alcohol are more likely to have rear-end collisions. The study also indicated that the changes in driving performance at 0.07% BAC during alcohol intake were less severe than at the same BAC during alcohol elimination, showing residual effects of alcohol and fatigue.

by R. G. Mortimer; S. P. Sturges
 University of Michigan, Hwy. Safety Res. Inst., Ann Arbor,
 Mich. 48105
 Grant HEW-MH-20666/AA-00295
 Rept. No. UM-HSRI-HF-75-1; PB-240774; 1975; 123p 47refs
 Rept. for 1 Jul 1972-5 Jan 1975. On Cover: Effects of Alcohol
 on Safe Driving Skills.
 Availability: NTIS

HS-016 894

REVIEW AND CRITIQUE OF NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION'S REVISED RESTRAINT COST-BENEFIT ANALYSIS

The initial and amending documents called "Analysis of Effects of Proposed Changes to Passenger Requirements of MVSS 208" are critiqued. Particular concern is focused around the use of baseline quantities of deaths and injuries of unrestrained occupants and dollar costs of deaths and injuries, which were used to develop a cost-benefit analysis to show

the effectiveness of lap belt-air bag systems over lap-shoulder harness systems. Aside from the cost of car related death and injury, other areas covered were: restraint system costs, both of installation and in relation to car-lifetime operation costs; seat belt usage; and restraint system effectiveness and benefits, in terms of fatality and injury prevention. While the National Hwy. Traffic Safety Administration (NHTSA) concluded that lap belts and airbags were more effective than lap-shoulder harnesses, the conclusion of this analysis is the reverse. Recommendations were: NHTSA should reexamine its estimates of restraint system effectiveness and costs, life and injury values, baseline injury quantities and belt usage (specifically; effectiveness estimates of belt restraints should be brought into line with real-life observation; effectiveness of the air bag should be established by large-scale real-world sampling results instead of by subjective judgement; life and injury valuations should be made realistic by eliminating exaggerated dollar estimates of unmeasurable intangible costs; the numbers of unrestrained occupant injuries used as a baseline should be adjusted so that aggregate injury costs are in line with reality; restraint system costs to the consumer should be based on the state of the art instead of optimistic projections; and belt use estimates should be in accordance with actual observation, rather than pessimistic projections). NHTSA should take the steps necessary to promote belt harness development and use by: dropping the air bag requirements of MVSS 208, so that money and effort can be put into harness development; states should be encouraged with funding to promulgate mandatory seat belt usage; and a sequential buzzer and light warning system should be required. Finally, NHTSA should continue testing air bags so that realistic cost-effectiveness data can be developed.

Economics and Science Planning, Inc., 1200 18th St. N.W., Washington, D.C. 20036
1975; 48p refs
Availability: Corporate author

HS-016 895

AN OVERVIEW OF EMERGENCY MEDICAL SERVICES IN LOS ANGELES COUNTY. INTERIM REPORT

Emergency Medical Service (EMS) resources; utilization; policies; and the needs of users, providers and government are summarized. An overview has been developed which can be characterized as comprehensive but not detailed. The existing system is examined in regard to services provided in the areas of treatment, transportation, communication, public health and consumer involvement, human services and training, and management. The kinds of data collected to describe the existing system were the numbers, types, and location of transportation and emergency facilities; the numbers and level of training of personnel; the numbers and types of incidents for which there were responses, by location of incident, and which were transported; the number and types of incidents (types of emergencies and emergencies as against primary visits) and method of arrival to emergency facilities; the time sequence as patients and victims enter and move through the EMS system; communication capabilities and problems; public education activities; the number and types of training programs; and system management responsibilities of various organizations. In most instances, it was not possible to obtain all the desired information. Instead, it was necessary to use estimates or surrogate measures. It is clear that better data is needed whether for planning, patient management, or system management.

Whatever the purpose, only the minimum set of data should be developed which is appropriate to the purpose at hand and not "all" the information which someone might conceivably want to have. The type of information needed for any of these purposes, however, cannot be specified until the operational requirements and performance criteria for the system are clear.

Los Angeles Countywide Coordinating Council on Emergency Medical Services, 6255 Sunset Blvd. Suite 817, Los Angeles, Calif. 90028
Contract ROP-73-24(E)-146-I
Rept. No. PB-240 251 : 1974 : 190p
Project supported by California Regional Medical Prog.
Contains reprint of "A socio-technical approach to the planning of Emergency Medical Services", R. B. Andrews, J.G. Brill, L. Horowitz. *Journal of the American College of Emergency Physicians* p416-20 (Nov-Dec 1973).
Availability: Corporate author

HS-016 896

VEHICULAR NOISE REGULATION IN HAWAII

Hawaii has adopted a comprehensive regulation on noise from motor vehicle operation and enforcement has begun. Separate sets of objective noise-level limits are specified for the operation of light and heavy vehicles and motorcycles. Limits are specified in terms of sound level A, posted speed limit, and measurement distances between 20 and 50 ft. For heavy vehicles, limits are specified also for times of day and days of the week. A goal of 75-dBA maximum for any vehicle under any condition of operation is identified for the future. Permits and truck routes are used to allow stringent standards to be set initially in residential areas without resulting in significant interference with transportation functions that are in the public interest.

by J. C. Burgess
Publ: *Journal of the Acoustical Society of America* v56 n3
p905-10 (Sept 1974)
1974; refs
Availability: See publication

HS-016 897

COMMERCIAL ROAD VEHICLE NOISE

The most important single parameter determining the noise of a modern diesel-engine vehicle is the engine speed. All of the other parameters, such as load and road speed, have only a secondary effect. The sources of noise on the vehicle are reviewed and it is shown how the characteristics of these sources determine the overall noise characteristics of the vehicle. It has been found that a simple model of the vehicle, as a number of coincident point sources, predicts the overall noise characteristics of the vehicle to plus or minus 2 dB(A). It is shown that there are two extremes of behavior, the rolling noise controlled vehicle and the power unit noise controlled vehicle; the engine is currently the controlling noise source. Tire noise has been investigated in some detail, as comparatively little has been published previously on this source. Empirical relationships between tire noise and speed, tire size and road surface roughness are given. It is concluded that tire noise is generated by impacting between elements of the tire tread and elements of the road surface. Modifications have been made to the engine, exhaust, intake and cooling fan of a 9 ton 6 liter diesel engine truck which have reduced its Inter-

national Standards Organization test noise level from 88 dB(A) to 80 dB(A). However, it is concluded that 80 dB(A) commercial vehicles are not feasible for production. In particular, insufficient data is known about cooling fan design. Finally, cab noise has been investigated and it has been found to originate from the same source as the exterior noise, power unit airborne noise. Therefore, any modifications to the power unit to reduce exterior noise will have a similar effect on interior noise. This is confirmed by the vehicle modifications mentioned above, which reduced the maximum cab noise from 87 dB(A) to 79 dB(A).

by P. E. Waters
 Publ: Journal of Sound and Vibration v35 n2 p155-222 (July 1974)
 1974; 55refs
 Availability: See publication

HS-016 898

RECOMMENDED PROCEDURES FOR VEHICLE CRASH TESTING OF HIGHWAY APPURTENANCES [ROADSIDE HAZARDS]

Procedures are presented for conducting passenger vehicle crash tests of roadside hazards, specifically: longitudinal barriers such as bridge rails, guardrails, median barriers, transitions, and terminals; crash cushions; and breakaway or yielding supports for signs and lights. The procedures promote the uniform testing of roadside hazards, so that highway engineers may confidently compare safety performance of two or more designs that are tested by different agencies. The procedures are guidelines that describe how such hazards should be tested and evaluated. The tests are only directed to the safety and dynamic performance of a hazard; and are devised to subject them to severe or the worst passenger vehicle impact conditions, rather than to typical or the more predominant highway situations. The hazard structures developed for these conditions are believed to provide a moderate level of protection to occupants of large vehicles. Although the innumerable highway site and object layout conditions that exist are recognized, it is impractical or impossible to duplicate these in a limited number of standardized tests. Hence, the approach has been to normalize test conditions, i.e. straight longitudinal barriers, flat road grades, and an idealized soil composition. These normalized factors have significant effects on a given hazard/vehicle interface, but become secondary in importance when comparing results of two or more systems. Guidelines are presented for evaluating safety performance, using three appraisal factors: structural adequacy, impact severity, and vehicle trajectory hazard. Depending on the objects function, it should contain, redirect, and/or permit penetration of the impacting vehicle in a predictable manner to satisfy structural adequacy requirements. Impact severity relates to the degree of hazard to which occupants of the impacting vehicle would be subjected and is measured in terms of vehicle acceleration and momentum changes. Vehicle trajectory hazard relates to the probable involvement of other traffic because of the post-crash path or position of the impacting car.

by M. E. Bronstad; J. D. Michie
 Southwest Res. Inst.
 Rept. No. NCHRP-153; PB-239 713 ; 1974 ; 24p 17refs
 Availability: TRB

HS-016 899

ARE REFLECTORIZED LICENSE PLATES A GOOD IDEA? SPECIAL REPORT

A critical appraisal of what is currently known about reflectorized license plates is presented, and then related to current attempts to provide objective bases for establishing their value in highway safety programs. The appraisal was conducted of the studies and reports which have been published dealing with the topic of reflectorized plates. Also reviewed were some human factors considerations in the driving task that appear to be relevant to reflectorization, as well as the appropriateness for cost-benefit analysis as a means of evaluating the worth of license plate reflectance as a safety measure. Finally the problems of conducting a controlled study of the effects of reflectorized plates were discussed, and some suggestions made as to ways in which the validity of such studies can be improved. With regard to visibility, it was found that the benefits of reflectorized plates are clearly definable; compared with conventional plates they improved vehicle detection distance from two to seven times, providing absolute detection distances of from 1,000 feet to as much as 0.4 miles. Reflectorization improved the legibility distance of license plates an average of about 30 feet, equivalent to about a 40% benefit. Of the six studies that have attempted to study the direct safety benefits of reflectorized plates in terms of accident reduction, all appear to show a reduction of night accidents and/or night rear-end collisions that may be associated with reflectorization. Analysis of the human factors involved in two relevant aspects of driving (avoidance of running into vehicles ahead and maintenance of path) clearly showed that reflectorized plates should be of benefit to the driver at night, even though this benefit is difficult to quantify. There is serious question as to the appropriateness of using techniques such as cost-benefit and cost-effectiveness analysis to establish the relative worth of license plate reflectorization. Cost-benefit analysis requires taking into consideration all of the costs, all of the benefits, and all of the alternatives, and requires that all costs and benefits be expressed in monetary terms. None of these studies have given valid results, therefore requiring further study.

by S. F. Hulbert; A. Burg
 University of California, School of Engineering and Applied Science, Los Angeles, Calif.
 1975 ; 34p 42refs
 Supported by grant from the 3M Co., St. Paul, Minn.
 Availability: Corporate author

HS-801 516

MOTOR VEHICLE SAFETY DEFECT RECALL CAMPAIGNS REPORTED TO THE NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION BY DOMESTIC AND FOREIGN VEHICLE MANUFACTURERS, JANUARY 1, 1975 TO MARCH 31, 1975

This tabulation of safety defect recall campaigns includes the make and model, model year, description of the defect requiring manufacturer's corrective action, number of vehicles recalled, date of notification, and identification number. Automobiles, trailers, trucks, semi-trailers, buses, electric cars, school buses, ambulances, mopeds, hubs, tires, brake wheel cylinders, handlebar bolts, and slide on campers are included.

HS-801 535

The status of domestic and foreign campaigns completed as of Dec 31, 1974, is also given.

National Hwy. Traffic Safety Administration, Washington,
D.C. 20590
1975; 40p
Availability: GPO

HS-801 535

MULTIDISCIPLINARY ACCIDENT INVESTIGATION REPORT AUTOMATION AND UTILIZATION, 1973. FINAL REPORT

A summary of contract accomplishments and discussion of data preparation, systems and utilization of data is presented. Appendices include a list of all contract documentation, accident and injury causation coding systems and an index of all automated MDAI case reports. Over 6000 clinical accident investigations have been conducted to-date (December 1973). These reports sponsored by the National Highway Traffic Safety Administration, the Motor Vehicle Manufacturers Association, and the Canadian Department of Transportation are being edited and processed into a common data base. All sponsors are also being provided direct access to the data base through the University of Michigan's time-shared computer system via remote batch and interactive terminals. The data base contains data recorded on an annotated "Collision Performance and Injury Report." The NHTSA has sponsored the automation of the MDAI reports, the documentation of the MDAI report editing procedures, the development of accident and injury causation coding systems, the addition of new data bank variables and a unique feature of the 1973 contract-the active involvement of NHTSA data users.

by J. C. Marsh, 4th
Highway Safety Res. Inst., Univ. of Mich., Ann Arbor, Mich.
48105
Contract DOT-HS-031-3-589
Rept. No. UM-HSRI-SA-73-13; 1975; 235p 30refs
Rept. for 1 Jan-31 Dec 1973.
Availability: NTIS

HS-801 565

1974 ACCIDENT EXPERIENCE WITH AIR CUSHION RESTRAINT SYSTEMS

An air cushion restraint system has been available to the public on certain model passenger cars since January 1974. In response to this opportunity to obtain field experience, the National Highway Traffic Safety Administration has established a nationwide reporting network and investigative capability for accidents involving airbag equipped cars. The reporting criteria for accidents require that the car be towed as a result of the accident, or that a front-seat occupant was injured, or that bag deployment occurred. The principal objective is to obtain the injury-reducing effectiveness of this restraint system in the total accident environment. This environment encompasses "towaway" accidents resulting in bag deployment and non-deployment. Definitive results are expected at the conclusion of the study. This paper summarizes the experience during the first year of the program, during

HSL 75-11

which time the rate of accident occurrence was far less than originally expected.

by R. A. Smith; C. J. Kahane
National Hwy. Traffic Safety Administration, Office of
Statistics and Analysis
Rept. No. SAE-750190; 1975; 35p 5refs
NHTSA Technical note. Presented at the SAE Automotive
Engineering Congress and Exposition, Detroit, 24-28 Feb 1975.
Availability: SAE

HS-801 584

INSTRUCTOR TRAINING INSTITUTES FOR NHTSA CURRICULUM PACKAGE: TRAFFIC COURT JUDGES. FINAL REPORT

A series of five national instructor training workshops were planned for traffic court judges and administrators by Technical Education Research Centers (Midwest Center) from October 23 to December 13, 1974. This series was presented to prepare and equip judges to be more effective in performing their duties. Also, it was designed to provide candidate trainers with the experience, knowledge, and skills necessary to plan, conduct, and evaluate workshops for traffic court judges and other traffic offense adjudicators. Most participants felt that the information presented was generally useful. Steps taken in planning, conducting, and evaluating the workshops, problems encountered in accomplishing the assigned project tasks, and recommendations for changes in the Traffic Court Judges workshop model are also described.

by V. E. Burgener; D. Reese
Technical Education Res. Centers, Inc., Midwest Center,
Champaign, Ill. 61820
Contract DOT-HS-4-00962
1975; 77p refs
Availability: NTIS

HS-801 588

DEVELOPMENT OF IMPROVED INFLATION TECHNIQUES. TASK 3. SYSTEM PERFORMANCE EVALUATION (AIRBAG). PROGRESS REPORT NO. 13, 1 NOVEMBER TO 30 NOVEMBER 1974

Three static inflation tests were performed using a child dummy and redesigned dual inflatable safety bag. The total dual bag size was reduced in an effort to decrease chest loading on the out-of-position child under dynamic conditions. The head bag shape was revised to reduce neck bending evidenced with the prior dual bag shape.

OLIN Corp., Energy Systems Operation, Marion, Ill. 62959
Contract DOT-HS-345-3-691
Rept. No. FR-13; 1974; 11p
Availability: NHTSA

HS-801 589

DEVELOPMENT OF IMPROVED INFLATION TECHNIQUES. TASK 3-SYSTEM PERFORMANCE EVALUATION. (AIRBAG) PROGRESS REPORT NO. 14, 1 DECEMBER TO 31 DECEMBER 1974

Using a dummy representing the 50th percentile, six year old male at 50 mph, a second week of sled testing (8 tests) was

conducted with a redesigned dual inflatable safety bag. The revised bag shape essentially eliminated the neck bending evidenced with the previous shape. A reduction in the total dual bag size required a reduction in the total gas flow and allowed a lower initial gas flow rate. The lower initial gas flow rate reduced the loadings on the out-of-position child dummy under dynamic conditions; however, the loadings were still marginal.

OLIN Corp., Energy Systems Operation, Marion, Ill. 62959
Contract DOT-HS-345-3-691
Rept. No. PR-14; 1975; 9p
Availability: NHTSA

HS-801 592

DEVELOPMENT OF AN ADVANCED PASSIVE RESTRAINT SYSTEM FOR SUBCOMPACT CAR DRIVERS. EXECUTIVE SUMMARY. FINAL REPORT

by M. Fitzpatrick
Minicars, Inc. 35 La Patera Lane Goleta, Calif. 93017
Contract DOT-HS-113-3-742
1975; 29p
Rept. for Jun 1973-Nov 1974 1974. For abstract see HS-801
528.
Availability: NTIS

HS-801 593

INJURY ASSESSMENT OF BELTED CADAVERS. FINAL REPORT.

Nine cadavers were subjected to collision simulations in a modified full size automobile with a modified three point harness such as is used in the 1974 automobile. Two cadavers were subjected to a 20 mph barrier equivalent velocity (BEV) collision; three at 30 mph BEV; and four at 40 mph BEV. The injury levels on the abbreviated injury scale (AIS), were: AIS-1 at 20 mph; two AIS-3 at 30 mph; and one AIS-3, two AIS-7 and one AIS-8 at 40 mph. The best fit curve through the AIS vs velocity data indicate that the AIS-3 level is reached at about 34.5 mph. Fatal injuries (AIS-6) are reached at 40 mph. The high injury levels at 40 mph appear to be aggravated by excessive submarining, lack of muscle tone, the advanced age of the cadavers, low temperature and its effect on tissues, lack of an instrument panel, and the adjustment of the harness. The injuries observed in the unembalmed cadavers are very similar to injuries reported in the literature in accident cases. However, the injuries appear to be more severe and occur with greater frequency at a given collision severity in the cadavers than in living humans. Rib fractures are the most prevalent injury but not necessarily the most serious. Three out of four cadavers exposed to 40 mph sustained vertebral fractures, while none of the three cadavers exposed to 30 mph had vertebral fractures. Injuries that were noted to be similar to those in published accident cases include bruises, abrasions, lacerations, fractures, and viscera ruptures. While the injuries observed are identical to those reported in the literature, they appear to occur at a lower barrier equivalent velocity in the cadaver than is observed on the highway.

by L. M. Patrick; R. S. Levine
Wayne State Univ., Detroit, Mich., 48202
Contract DOT-HS-146-3-753
1975; 137p 51refs
Availability: NTIS

HS-801 594

SAFETY BELT INTERLOCK SYSTEM: USAGE SURVEY. FINAL REPORT

The effectiveness of the interlock system in increasing safety belt usage was measured. Three separate studies were conducted: among rental customers at U.S. airports (to obtain a large body of data early in the 1974 model year); among rental car customers at Toronto International Airport, where different types of use-inducing systems could be studied; and among owners of private cars in the general population of vehicles. The first was conducted at Miami, Chicago, and Los Angeles. Customers returning 1974 model rental cars at these airports were observed for their safety belt usage, and a sample of non-users immediately interviewed to determine the circumstances and attitudes surrounding their nonusage. Similar methods of observing and interviewing were followed at Toronto. The third was conducted in a sample of U.S. cities by having observers note the usage patterns and sex of the driver and right outboard passenger, certain major characteristics of the car, and the license number. The license number permitted verification of the observed model year, provided other descriptive information about the car, and afforded a means of conducting a follow-up telephone interview with the presumed driver. This interview covered practices and attitudes with regard to safety belt usage and the interlock system. The study revealed a usage decline of 23%, from 64% to 41%, over the nine months of the survey. Some of the reasons for the decline and initial non-use were: system malfunctions as the car grew older; users found the belts uncomfortable or difficult to use; and an initial psychological opposition to wearing it. The result of this resistance was the physical defeat (disconnection) or circumvention (belt manipulation) of the system.

by A. Westefeld; B. M. Phillips
Opinion Res. Corp., North Harrison St., Princeton, N.J. 08540
Contract DOT-HS-4-00805
Rept. No. 51183; 1975; 145p
Report for Nov 1973-Mar 1975.
Availability: NTIS

HS-801 595

UNIFORM TIRE QUALITY GRADING-- TREADWEAR. FINAL REPORT

The treadwear testing in the main followed the UTOG-treadwear procedure as published in the Federal Register on Jan. 4, 1974 (Docket 025-notice 07). In this test procedure the route is selected such that the NHTSA Control Tire is worn to a specified level in 16,000 miles. In this contract a 6505% Control Tire treadwear goal was selected after preliminary trials indicated that a higher wear level could only be obtained by using excessive speed on the curves. Using this common treadwear goal for all the test routes, the various single car, single 4-car convoy and dual 4-car convoy tests required significant but practical, "in the field" route adjustments. The data show the amount of treadwear decreases as the number of vehicles in convoy increases. The contract compared the treadwear obtained from similar vehicle models of two different car manufacturers. Using the 7.75-14 NHTSA Control Tires as the measuring device the 1974 Ford Torino was 5% better for treadwear than the 1974 Plymouth Satellite. In Phase 1, the 7.75-14 NHTSA Control Tires (Armstrong Tire-Sept. 1974) were used to rate six (6) groups of special and commercial tires. In Phase 02 the 8.55-15 NHTSA Control Tires (Armstrong Tire-Aug.

1974) were used to rate three (3) groups of San Angelo course monitoring tires.

South Texas Tire Test Fleet, Inc., Drawer J, Devine, Tex.
Contract DOT-HS-4-00896
1975; 73p
Test Period: July-Dec 1974.
Availability: NHTSA

HS-801 596

U.S. RESEARCH SAFETY VEHICLES(RSV) PHASE 1 PROGRAM. VOL. 3 RSV CHARACTERISTICS, AND PERFORMANCE SPECIFICATIONS. FINAL REPORT

The characterization descriptors of the two RSV concepts (4 passenger family sedan and 2 passenger utility sedan) considered appropriate for operation in the projected mid-1980's traffic environment are presented, as well as the rationale supporting the characterizations. RSV safety performance characteristics are discussed in terms of: visibility, lighting, and signaling; riding and handling systems, i.e. braking and steering systems, handling response, overturning immunity, front and rear suspension systems, wheels and tires; and crashworthiness, as regards passenger compartment and vehicle body integrity, and passenger restraints. Functional performance characteristics are also discussed, such as the power train and accessories. Comparisons are made between these specifications and the DOT/NHTSA guideline specifications for intermediate RSVs, dated February 16, 1973.

by J. Andon; E. Dodson; A. Khadilkar; R. Olson; L. Pauls; W. Rup
AMF Inc., Advanced Systems Lab., 495 S. Fairview Ave., Goleta, Calif. 93017
Contract DOT-HS-4-00841
Rept. No. ASL-B31-1975; 375p 112refs
Rept. for Jan 1974-Apr 1975. Vols. 1 and 2 are HS-801 598 and HS-801-597.
Availability: NTIS

HS-801 597

U.S. RESEARCH SAFETY VEHICLE (RSV) PHASE 1 PROGRAM-VOL. 2, PROGRAM DEFINITION FOUNDATION. FINAL REPORT

Current passenger car usage patterns and factors influencing usage are analyzed and projections of usage patterns in the mid-1980's are made, based on demographic, economic, and transportation need factors. Accident assessments relative to injury severity and projections of the 1980's accident environment are developed in terms of six types of accidents: vehicle with other vehicles (with such variables as, area impacted, car weights, and impact speed), non-collision (such as rollovers, with prime variables being car weight, road geometry, and speed), vehicle with pedestrian (with variables of area impacted, car weight, speed at impact and pedestrian age) vehicle with fixed objects (variables being the object struck and its geometry, car weight, impact area of car and speed at impact), vehicle with motorcycle (with variables of car front impacting motorcycle, motorcycle impacting car side and car rear) and vehicle with bicycle (with the same variables as the motorcycle). The societal costs of accidents are developed and a determination of the payoff potential for the 1985 accident environment is made. A benefit-cost analysis is made relative to vehicle design configurations and injury reductions, based on pro-

jections for the six types of accidents plus vehicle submergence and fire.

by J. Andon; E. Dodson; A. Khadilkar; R. Olson; L. Pauls; W. Rup
AMF Inc., Advanced Systems Lab., 495 South Fairview Ave., Goleta, Calif. 93017
Contract DOT-HS-4-00841
Rept. No. ASL-B31-Vol-2; 1975; 434p 60refs
Rept. for Jan 1974-Apr 1975. Vol. 1 is HS-801 598 and vol. 3 is HS-801-596.
Availability: NTIS

HS-801 598

U.S. RESEARCH SAFETY VEHICLE (RSV) PHASE 1 PROGRAM-VOL. 1, INTRODUCTION AND EXECUTIVE SUMMARY. FINAL REPORT

by J. Andon; E. Dodson; A. Khadilkar; R. Olson; L. Pauls; W. Rup
AMF Inc., Advanced Systems Lab., 495 S. Fairview Ave., Goleta, Calif. 93017
Contract DOT-HS-4-00841
Rept. No. ASL-B31-Vol-1; 1975; 163p
Report for Jan. 1974-Apr 1975. For abstract, see vol. 2, HS-801 597 and vol. 3, HS-801 596.
Availability: NTIS

HS-801 599

RESEARCH SAFETY VEHICLE (RSV) PHASE 1 FINAL REPORT. VOL. 2, AUTOMOBILE USAGE TRENDS, ACCIDENT FACTORS

Projected traffic environment for the mid-1980's is identified, current accident data assessed, these data projected to the mid-1980's. The projected 1985 traffic environment for the RSV will contain 115.2 million cars, 9 million motorcycles, 33.9 million trucks, 533,000 school buses, and 94,000 commercial buses. These vehicles will be driven a total of 1,672.2 billion vehicle miles during the year, mostly at higher speeds than prevailed in 1973. For the assumed accident environment, an estimate of accident exposure for the mid-1980's, the RSV system model will determine the vehicle safety measure levels required to minimize fatalities and injuries, subject to the constraints of cost, weight, and overall product feasibility. Vehicle and occupant dynamics are determined by exercising mathematical models for a set of representative collision types over the complete spectrum of accident severity. The resulting occupant dynamics are transformed into injury levels through a biomechanical model, and number of fatalities and injuries are calculated by forming a probability weighted average of those injury levels, weighted over accident type and severity. Accidents are studied with regard to frequency, type (pedestrian, fixed object, rollover and front, side and rear impacts), probability of involvement by single or two vehicle type, closing speed and severity. The Collision Performance and Injury Report, Rev. 3 (CPIR3), a file maintained by the Highway Safety Research Institute, is discussed in detail in relation to file data, structure, and accident severity. The driving population is reviewed and projected by age and sex, and seating position

November 30, 1975

HS-801 604

and size of passenger is tabulated. Pedestrian accidents and injuries, and their relation to vehicle design are covered.

Ford Motor Co., Environmental and Safety Res. Office, P.O. Box 2053, Dearborn, Mich. 48121
Contract DOT-HS-4-00842
1975 ; 109p 15refs
Rept. for Jan 1974-Apr 1975. Vol 1 (executive summary) is HS-801 600 and vol. 3 is HS-801 606.
Availability: NTIS

HS-801 600

**RESEARCH SAFETY VEHICLE (RSV) PHASE 1
FINAL REPORT. VOL. 1. INTRODUCTION,
EXECUTIVE SUMMARY**

Ford Motor Co., Environmental and Safety Res. Office, P.O. Box 2053, Dearborn, Mich., 48121
Contract DOT-HS-4-00842
1975 ; 30p
Rept. FOR Jan 1974-Apr 1975. For abstract, see vol. 2, HS-801 599 and vol. 3, HS-801 606.
Availability: NTIS

HS-801 601

**PASSENGER VEHICLE AND LIGHT-TRUCK
BRAKING SYSTEMS INSPECTION EQUIPMENT--
PHASE 2. VOL. 2--TECHNICAL REPORT. FINAL
REPORT**

An inspection system was developed and operationally demonstrated that is capable of detecting safety related brake system defects and degradations in passenger vehicles and light trucks. The developed inspection system consists of a low-speed high retarding chassis brake force dynamometer, a pedal force and displacement transducer, two hand held inspection control consoles, automatic data processing equipment, and inspection procedures. The brake inspection is conducted using performance tests and non-performance checks. The performance tests consist of static vehicle tests such as for hydraulic leaks, and dynamic brake tests conducted on the chassis brake dynamometer. All of the performance tests are conducted with controlled test inputs and automatic inspection results measurement and processing. The non-performance checks include visual checks under the vehicle and under the hood and a series of checks requiring vehicle wheel removal. The inspection system and individual major components were tested to insure that function and performance meet the required specifications. The system testing and evaluation was done using dead weight calibration techniques, known inputs from an instrumental test vehicle, pre-programmed brake faults installed in a test vehicle and brake system inspections on selected in-use vehicles.

by T. W. Keranen; T. J. Hemak; A. E. Sisson; P. Bounds
Bendix Res. Labs., Bendix Center, Southfield, Mich. 48076
Contract DOT-HS-090-2-477
Rept. No. BRL/TR-75-7610 ; 1975 ; 184p
Rept. for Oct 1973-Jan 1975. Vol. 1 is HS-801 602.
Availability: NTIS

HS-801 602

**PASSENGER VEHICLE AND LIGHT-TRUCK
BRAKING SYSTEMS INSPECTION EQUIPMENT--**

**PHASE 2. VOL. 1--SUMMARY REPORT. FINAL
REPORT**

by T. W. Keranen; T. J. Hemak; A. E. Sisson; P. Bounds
Bendix Res. Labs., Bendix Center, Southfield, Mich. 48076
Contract DOT-HS-090-2-477
Rept. No. BRL/TR-75-7610; 1975 ; 20p
For abstract see HS-801 601. Report for Oct 1973 - Jan 1975.
Availability: NTIS

HS-801 603

**RESEARCH SAFETY VEHICLE PHASE 1. VOL. 1.
EXECUTIVE SUMMARY. FINAL REPORT**

by D. Struble; G. Bradley
Mincars, Inc., 35 La Patera Lane, Goleta, Calif. 93017
Contract DOT-HS-4-00844
1975 ; 25p
Report for Jan 1974-Apr 1975. For abstract, see vol. 2, HS-801 604 and vol. 3, HS-801 605.
Availability: NTIS

HS-801 604

**RESEARCH SAFETY VEHICLE--PHASE 1. VOL. 2--
PROGRAM DEFINITION FOUNDATION. FINAL
REPORT**

In order to determine objectively the design having the greatest safety payoff for the mid-1980s, a quantitative description of the societal cost of accidents in 1985 is developed and then the characteristics and performance of various safety subsystems are projected. The combination of subsystems that produces the greatest safety payoff in 1985 at reasonable benefit/cost is the preferred system. The key to the analysis is a detailed description of the accident costs of 1985. An interpretation of today's accident costs is integrated with a prediction of how the traffic situation will change by 1985 to produce a description of accident costs for 1985. This description details the costs according to the velocity of the collision, the mode (frontal, side, etc.), and the severity of injury, so as to associate severity with each accident type in each 10 mph velocity range. Costs are also detailed according to the weight class of car in which the cost is incurred; the program aims at modifying the small car since that is where the greatest future costs will occur. Then added in to the 1985 small car population are various combinations of structure and restraint performance, braking performance, etc. which are observed as to how each modification reduces severity in each mode-velocity cell. Since the cost of each safety subsystem or structural modification can also be determined, the cost to the benefit in reduced accident costs earned by the subsystem can be compared. Projection through the 1980s of vehicle usage and vehicle masses showed the bulk of injury costs shifting to small cars. These injuries are incurred at higher equivalent velocities, due to the momentum disadvantage of smaller cars.

by D. Struble; G. Bradley
Mincars, Inc., 35 LaPatera Lane, Goleta, Calif. 93017
Contract DOT-HS-4-00844
1975 ; 203p 121refs
Report for Jan 1974-Apr 1975. Vol. 1 is HS-801 603, and vol. 2 is HS-801 605.
Availability: NTIS

HS-801 605

RESEARCH SAFETY VEHICLE PHASE 1. VOL. 3. VEHICLE CHARACTERIZATION AND PERFORMANCE SPECIFICATION. FINAL REPORT, JUNE 1975

The primary attributes of a research safety vehicle (RSV) design configuration are discussed in terms of safety, economy, energy and environment. The single most important conclusion to be drawn from the cost/benefit analysis discussed is that the investment in safety systems with quantifiable safety payoff can be substantial, even at high benefit/cost ratios. This economy relates to both production or capital costs and to use or operating costs. Both costs are related to vehicle weight, especially operating costs, in terms of the effect of weight on fuel economy. Fuel economy as regards miles-per-gallon will also play an ever increasing role in vehicle marketability. Fuel economy can be maximized by the selection of a very efficient powerplant (the Honda CVCC stratified charge engine) and by minimizing vehicle weight, aerodynamic drag, and acceleration performance. The RSV will have to conform to the projected emission level prescribed for the 1977 model year. The performance specifications discussed center around vehicle crashworthiness and occupant protection. The structural properties of both vehicles and restraint systems were tested with front and side collisions. The results of this study were that the RSV was characterized as an automobile having a maximum weight of a present-day subcompact with the usable space of a compact. Crash tests revealed that foam-filled closed sheet metal volumes and airbag restraints provided a very high degree of occupant protection, particularly in frontal, frontal oblique, and frontal offset modes at higher velocities.

by D. Struble; G. Bradley
Minicars Inc., 35 La Patera Lane, GOLETA, Calif. 93017
Contract DOT-HS-4-00844
1975; 151p 9refs
Report for Jan 1974-Apr 1975. Vol. 1 is HS-801 603, vol. 2 is HS-801 604.
Availability: NTIS

HS-801 606

RESEARCH SAFETY VEHICLE (RSV) PHASE 1. FINAL REPORT. VOL. 3. VEHICLE CHARACTERIZATIONS, PERFORMANCE SPECIFICATIONS

Three aspects of research safety vehicle (RSV) development are discussed: an RSV optimization system, RSV characterization, and RSV performance specification. RSV optimization was achieved through the use of a computer model, which consisted of an accident exposure environment projection for the mid-1980's, based on statistical distributions of car weights and impact speeds in each of the major crash modes (head-on, offset frontal, front-to-side, front-to-rear, and frontal pole and tree collisions) determined from current accident files; a dynamic vehicle structure simulation to determine the pattern of vehicle crash deceleration, deformation and compartment intrusion; a dynamic occupant acceleration simulation to determine occupant response under various accident conditions and utilizing various restraint systems; a biomechanical model, based on occupant/vehicle simulation to evaluate human tolerance in relation to injury severity and fatality probability (including conditions of ejection and rollover); an optimization program which searches all the vehicle and occupant restraint

parameter combinations for that set of parameters which yields the smallest measure of injury; and a benefit-cost analysis which relates the societal benefits in dollars to the incremental costs. RSV characterization is concerned with: the producibility constraint (the practical modification limits to enhance crashworthiness), vehicle configuration (interior and exterior dimensions), the results of the optimization and benefit-cost analysis, and functional parameters of alternative restraint systems. RSV performance specifications is that set of parameters expected to minimize traffic casualties across a range of crash modes, impact speeds, and occupant sizes. These parameters relate to energy management, occupant protection, accident avoidance (specifically: braking performance, steering, handling, field-of-view, and vehicle lighting), post-crash factors (extrication, fire and submersion), and non-safety factors (interior package, controls and displays, and vehicle performance).

Ford Motor Co., Environmental and Safety Res. Office, P.O. Box 2053, Dearborn, Mich. 48121
Contract DOT-HS-4-00842
1975; 349p refs
Rept. for Jan 1974-Apr 1975. Vol. 1 (Executive Summary) is HS-801 600 and vol. 2 is HS-801 599.
Availability: NTIS

HS-801 607

RESEARCH SAFETY VEHICLE PROGRAM (PHASE 1)--VOL. 1. RSV INTRODUCTION AND EXECUTIVE SUMMARY. FINAL TECHNICAL REPORT

by P. M. Miller; S. M. Pugliese; M. O. Ryder; F. A. Duwaldt; S. W. Chesley
Calspan Corp., 4455 Genesee St., P.O. Box 235, Buffalo, N.Y. 14221
Contract DOT-HS-4-00838
Rept. No. ZN-5450-V-11; 1975; 99p 8refs
Rept. for Jan 1974-Apr 1975. For abstract, see HS-801 608 (vol. 2), HS-801 609 (vol. 3), HS-801 610 (vol. 4).
Availability: NTIS

HS-801 608

RESEARCH SAFETY VEHICLE PROGRAM (PHASE 1)--VOL. 2. RSV PROGRAM DEFINITION AND FOUNDATION; ACCIDENT DATA, AUTOMOBILE USAGE, NATURAL RESOURCES, RELATED SAFETY COSTS. FINAL TECHNICAL REPORT

Background data, accident statistics, vehicle usage trends, natural resource availability projections, safety related costs, and vehicle crashworthiness implications) were developed to support Research Safety Vehicle (RSV) specifications. The accident analysis included data on injury producing accidents (data sources used, pedestrian-, single vehicle-, and multi-vehicle-type accidents, types of pedestrian injuries, vehicle occupant ejection, passenger compartment intrusion and design implications, and restraint systems); vehicle damageability and repairability (repaired and unrepaired damage, repair costs, damage location/cost distribution, and component part replacement); and accident causes due to human, environmental or vehicle factors (vehicle and driver visibility and braking systems). Automobile usage trends were discussed in terms of population size and structure and usage patterns. This rising usage trend, however, is constrained by the economic factors of increased world energy and materials demand resulting in

cost increases. Roadway improvement projections are discussed in terms of traffic and speed control for the reduction of the accident rate and fuel consumption. The impact of alternative transportation modes was explored, as regards vehicle mix for both passenger and cargo loads. The societal costs of accidents were also covered, as well as the cost of the RSV effort to consumers. Crashworthiness performance specifications were based on the analysis of fatal accident patterns, and kinetic energy management applied to structural specifications and passengers restraint system requirements of three point belts and air bags. In addition, a description of the Automotive Crash Injury Research program is given, as well as an explanation of the forms used, an analysis of single vehicle accident data collected, and a brief mention of injury scales.

by P. M. Miller; S. M. Pugliese; M. O. Ryder; F. A. DuWaldt; S. W. Chesley
Calspan Corp., 4455 Genesee St., P.O. Box 235, Buffalo, N.Y. 14221

Contract DOT-HS-4-00838

Rept. No. ZN-5450-V-12; 1975; 478p 163refs

Rept. for Jan 1974-Apr 1975. Vol. 1 is HS-801 607; vol. 3 is

HS-801 609; vol. 4 is HS-801 610.

Availability: NTIS

HS-801 609

RESEARCH SAFETY VEHICLE PROGRAM (PHASE 1)-VOL. 3. RSV CHARACTERIZATION AND PERFORMANCE SPECIFICATION. FINAL TECHNICAL REPORT

Vehicle characteristics suitable for an automobile that might be introduced in the mid-1980's are defined under the specific constraint that the curb weight not exceed 3000 lbs. A "family car" configuration (4 to 5 seating positions plus adequate cargo space) is chosen as the representative of an RSV car model line to be studied. Sizing follows from the selected family model and the weight constraint; and configuration is chosen to obtain high packaging efficiency combined with best potential safety gain. The various components of safety and road performance are reviewed. Technical specifications are given for the areas of crash avoidance, crash energy management, primary occupant protection, post-crash safety and pedestrian protection. Corresponding criteria and test methodologies are discussed. Guidelines are developed to insure compliance with realistic manufacturing producibility and construction material requirements suitable for the mid-1980's time frame. The vital role of recovery (recycling) of the constituent materials of automobiles as a vital solution to energy and material resources limitations is emphasized. Finally, cost implications of the RSV are reviewed and placed in proper context.

by P. M. Miller; S. M. Pugliese; M. O. Ryder; F. A. DuWaldt; S. W. Chesley
Calspan Corp., 4455 Genesee St., P.O. Box 235, Buffalo, N.Y. 14221

Contract DOT-HS-4-00838

Rept. No. ZN-5450-V-13; 1975; 344p 65refs

Rept. for Jan 1974-Apr 1975. Vol. 1 is HS-801 607; vol. 2 is

HS-801 608; vol. 4 is HS-801 610.

Availability: NTIS

HS-801 610

RESEARCH SAFETY VEHICLE PROGRAM (PHASE1)-VOL. 4. RSV CONCEPTUAL DEFINITION.

FINAL PHASE 1 BI-MONTHLY REPORT. FINAL TECHNICAL REPORT

A preliminary conceptual design intended to meet specifications recommended for the Research Safety Vehicle (RSV) is presented. It is expected that this design will be the basis for further development in Phases 2 and 3 of the program. The design assumes derivation of the RSV from a production model automobile. Numerous candidate base vehicles were considered; and the rationale for selecting the Chrysler France (designated as vehicle C-6) is discussed. This vehicle has a curb weight of 2300 lbs., accommodates five passengers, uses a transverse engine, and has front wheel drive. The combination of front wheel drive and a transverse engine improves frontal crashworthiness because of a better engine/firewall load distribution and less engine/compartments intrusion. The fuel economy and acceleration capabilities of the C-6 and the 1974 Pinto, Vega and VW Superbeetle were compared under urban and highway conditions. Accident avoidance characteristics of the C-6 were discussed, specifically in terms of braking systems, the use of run-flat and multiple-cell tires, and steering. The crashworthiness of the C-6 was also tested using both static crush and flat barrier impact methods for frontal and rear end collisions. The subsystems of the C-6 were also dealt with, these include basic design and styling, occupant/cargo space (relative to comfort and crashworthiness), and bumper systems (relative to vehicle and pedestrian collision). The vehicles crashworthiness was extensively discussed, specifically in terms of structural modification and materials to be used (aluminum and HSLA steel) to achieve the desired compartment integrity. Protection for the occupants was also considered in the design of the compartment interior with tests of urethane foam and paper honeycomb type padding. Many types of active and passive restraints are considered. These restraints include both strap and inflatable three point belts, air bags and bolsters. The anchoring and structural needs of these restraints are stressed.

by P. M. Miller; S. M. Pugliese; M. O. Ryder; F. A. DuWaldt; S. W. Chesley
Calspan Corp., 4455 Genesee St., P.O. Box 235, Buffalo, N.Y. 14221

Contract DOT-HS-4-00838

Rept. No. ZN-5450-V-14; 1975; 169p 38refs

Rept. for Jan 1974-Apr 1975. Executive summary (vol. 1) is

HS-801 607; vols. 2-3 are HS-801 608 and HS-801 609.

Availability: NTIS

HS-801 614

COSTS AND BENEFITS OF MOTOR VEHICLE INSPECTION

The problem of estimating the costs of implementing and operating motor vehicle inspection (MVI) programs, as well as the values of associated societal benefits is addressed. A comparison of private and State owned inspection stations shows that privately owned State licensed stations charge an average of \$2.50 for MVI, with State expenses being limited to enforcement and administration, and met through sticker fees. AVCO Corporation concluded that for State-owned and operated lane-type inspection facilities, separate safety and emission inspection facilities are more costly than multi-purpose facilities, breakeven fees are dominated by operating costs, and fees between \$2-6 are feasible. Values of MVI include some State data which indicate that it may be 45-75% effective in reducing defect caused accidents, and helpful in controlling emissions, affecting both air quality and fuel usage.

decreasing weight in comparison to conventional metallic structure. The program will include a survey of present and experimental applications of plastic materials to automotive structure, fabrication and testing of a selected frontal design for a subcompact size automobile, and evaluation of problems associated with production feasibility, cost, and other problems which affect the use of plastic in automotive structures. A 30 mph test on the simulated one-half frontal structure was completed, with the total crush distance 13 inches, as predicted by computer simulation. The outline of the final report, as well as the cost (entered on the Task and Sub-Task Schedule), are attached.

by H.A. Jahnle
Budd Co., Technical Center, 300 Commerce Drive, Ft.
Washington, Pa. 19034
Contract DOT-HS-00929
1975; 6p
Availability: NHTSA

HS-801 622

FIAT 2500B/AMF ESVS.-FRONT-TO-FRONT IMPACT TEST AT 50MPH. FINAL TEST RESULTS

Test results are presented of a 50 mph front-to-front crash between a 5200 pound AMF Experimental Safety Vehicle (ESV), and a Fiat 2500 pound ESV, equipped with two anthropomorphic dummies and an experimental energy-absorbing seat. The crash test furnished data on the structural integrity of the Fiat ESV and the dynamic response of its two occupants when involved in a collision with a larger ESV. The test also investigated the potential benefits of velocity-sensitive front-end structures to accommodate lighter weight vehicles such as the Fiat ESV. The AMF vehicle's hydraulic system stroked almost 15 inches compared to the 16.5-inch dynamic crush of the Fiat, indicating that the heavier AMF vehicle absorbed a significant portion of the crash energy which would otherwise have been transmitted to the smaller vehicle. This test was successfully completed, and the problems of small car/large car compatibility and aggression can be alleviated by immediate and practical methods. The effectiveness of the energy-absorbing seat indicates that human survival would be assured in considerably more severe crashes than those experienced in the test. The test was successful in that the Fiat compartment integrity was adequately maintained, and the severity index for the dummies was below the maximum given in FMVSS 208 and ESV specifications.

Ultrasystems, Inc., Dynamic Science Div., 1850 W. Pinnacle
Peak Rd., Phoenix, Ariz. 85027
Contract DOT-HS-4-00860
Rept. No. 2310-74-61; 1975; 148p 4refs
Rept. for May 1974.
Availability: NTIS

HS-801 623

TOYOTA/AMF-2 ESVS-FRONT-TO-REAR IMPACT TEST AT 60MPH

The test results are presented of an aligned front-to-rear collision between a Toyota Experimental Safety Vehicle (ESV) and a 4,000 pound AMF ESV at a nominal closing speed of 60 mph. The objective of this test was to assist in the understanding of problems associated with crashworthiness in the traffic mix, i.e., car-to-car compatibility and aggressiveness. This

HS-801 620

The object of this research effort is to determine the feasibility of employing plastic materials in the fabrication of vehicle structure for the purpose of improving crashworthiness and

crash test evaluated the structural integrity and dynamic response of the Toyota ESV and the dynamic response of its two occupants when involved in a collision with a larger ESV. The test also investigated the potential benefits of velocity-sensitive front-end structures to accommodate intermediate weight vehicles such as the Toyota ESV. The test was successful in that Toyota compartment integrity was adequately maintained and all occupant responses met established specifications. The AMF vehicle's hydraulic system stroked almost 17 inches, indicating that the heavier AMF vehicle absorbed a significant portion of the crash energy. Based on the negligible compartment intrusion and the generally low levels of dummy response, a safe closing speed of at least 65 mph appears practicable.

Ultrasystems, Inc., Dynamic Science Div., 1850 West Pinnacle Peak Rd., Phoenix, Ariz. 85027
Contract DOT-HS-4-00860
Rept. No. 2310-74-64; 1975; 111p 3refs
Availability: NTIS

HS-801 624

RESEARCH SAFETY VEHICLE-PHASE 1. VOL.1. (INTRODUCTION AND EXECUTIVE SUMMARY). FINAL REPORT

Volkswagenwerk AG, Res. Div., 3180 Wolfsburg, West Germany
Contract DOT-HS-4-00843
1975; 143p
Rept. for 18 Jan 1974-18 Apr 1975. Vol. 2 is HS-801 625, vol. 3 is HS-801 626. For abstracts see vols. 2 and 3.
Availability: NTIS

HS-801 625

RESEARCH SAFETY VEHICLE. PHASE 1. VOL. 2. SECTION 3. FINAL REPORT

The program definition foundation for a research safety vehicle to the mid-1980's is described. The current U.S. accident situation, as well as the automobile usage trends, have been carefully investigated. The accident data analysis was derived from accident reports and statistics, which were examined in relation to general traffic and accident situations, accident causation (human, vehicular, environment and time factors), injury causation, and vehicle size and mass mix. It was concluded that there would be little change in 1985 from the 1972/73 relative frequency distributions of accident types and impact sites. The vehicle mix was projected to show a trend toward a European vehicle size mix. Automobile usage trends were discussed in terms of overall demographic considerations, fuel economy and energy demands, power plant technology, the impact of environmental controls, and the impact of alternative transportation modes. It was concluded that, in spite of the increasing research on alternative transportation modes and engine systems, the passenger car with gasoline engine will continue to be the predominant mode. Benefit-cost techniques and their applicability to automobile safety measures were considered and led to a benefit-cost evaluation based on given cost consistent conditions. Specific emphasis was placed on benefit optimization as an aid in vehicle design, input data relative to occupant safety, and the cost of injuries and fatalities to both the individual and to society. Finally, a systems analysis of power plants was considered comparing both their technological and ecological aspects. This

analysis was also used to compare different possible transportation modes.

Volkswagenwerk AG, Res. Div., 3180 Wolfsburg, West Germany
Contract DOT-HS-4-00843
1975; 802p 158refs
Rept. for 18 Jan 1974-18 Apr 1975. Vol. 1 is HS-801 624 and vol. 3 is HS-801 626.
Availability: NTIS

HS-801 626

RESEARCH SAFETY VEHICLE, PHASE 1. VOL. 3. SECTION 4 AND 5. FINAL REPORT

Vehicle characterization (sec.4) is a qualitative overview of the vehicle dimensions which were made the basis for the preliminary design, while performance specification (sec. 5) includes design requirements. Vehicle characterization includes the vehicle configuration, safety performance (crash avoidance capability, crash energy management, pedestrian and occupant safety, cost crash safety), and functional performance (non-safety features such as the powertrain). Performance specifications are the vehicle design requirements necessary to conform to the vehicle characteristics set forth. Crash avoidance characteristics were explored using driving simulators, skid pad tests, tests of driver and vehicle response, and vehicle stability. Crash energy management was concerned with design criteria, mass distribution and collision probability, vehicle compatibility, vehicle deformation, engine properties, crash energy management in symmetric frontal impacts, restraint load and occupant motion at frontal impact, nonsymmetric and pole impacts, crash energy management in lateral impacts, procedures for force and energy absorption measurement, and recommended test procedures. Pedestrian and cyclist protection was discussed in terms of visibility, acoustical and optical signaling, exterior protrusions, bumper designs, and impact tests. The following aspects of occupant protection were covered: permissible head, chest and abdomen loads, permissible neck movement, compartment integrity and interior intrusion, and emergency egress and extrication. The final section "Supporting Rationale" explains the input data and the results of the benefit/cost optimization which was used to establish consistent test conditions.

Volkswagenwerk AG, Res. Div., 3180 Wolfsburg, W. Germany
Contract DOT-HS-4-00843
1975; 635p 164refs
Rept. for 18 Jan 1974-18 Apr 1975. Vol.1 is HS-801 624 and vol.2 is HS-801 625.
Availability: NTIS

HS-801 627

SUBCOMPACT CAR CRASHWORTHINESS PROGRAM. PROGRESS REPORT, APRIL 1975

The collection of data on the foam-filled structure as used in a modified Ford Pinto and a continuation of the program to determine the static and dynamic properties of the foam are reported. Square and round sections of foam were constructed and subjected to static crush. On some of the sections, the encapsulating material was steel sheet, on others it was cloth (nylon and dacron). For six of these sections, the foam density was about 2.24 lbs/cu.ft. Of these, three had 8 in. sq. cross sections and were covered with sheet metal. The load carried by the sheet metal was taken to be 1,520 lbs. The other three

were cloth covered, of which two had a geometry identical to the foamfilled sheet metal specimens. The other one had an 8 in. diameter circular cross section. In all cases, the initial crush stress was about 20.3 psi, rising gradually to about 25.6 psi at 50% crush. The static results were then extended into the dynamic range. A series of eight tests were run in which 36 in. long, 10 in. diameter cylinders filled with foam were impacted and crushed by a moving 177 lb. sled. Five cylinders with various foam compositions were compared to an empty cylinder over an impact range from 20 to 46 mph. The lighter foams showed a crush stress of 32 psi while heavier foam densities had effective crush stresses upward to 175 psi. Tests were also conducted to provide data for the evaluation of the modified Pinto with advanced driver and passenger restraints in an 80 mph closing impact. The bullet car was an unmodified Ford LTD. The dummies in the Pinto were protected by a column mounted air bag (driver) and an air belt (front passenger). The dummies in the LTD were protected by three point harnesses. In this test, the Pinto underwent a 50 mph change in velocity. Both restraint systems worked extremely well with injury well below the allowable criteria. Post test photographs and acceleration charts of the vehicles; passengers' and drivers' heads and chests are included.

Minicars Inc., 35 La Patera Lane, Goleta, Calif. 93017
Contract DOT-HS-113-3-746
1975; 91p
Prepared in cooperation with Ultrasystems, Inc.
Availability: NTIS

HS-801 632

ON THE PUBLIC INFORMATION AND EDUCATION COUNTERMEASURE OF ALCOHOL SAFETY ACTION PROJECTS. ANNUAL REPORT

In 1970, the National Highway Safety Administration proposed a comprehensive program of alcohol countermeasures aimed at reducing the number of alcohol-related traffic crashes and resultant death and injury. Since 1971, 35 community-based Alcohol Safety Action Projects (ASAP's) in different states have been testing a range of countermeasures. The progress of one of the most critical and promising, Public Information and Education, is reviewed. The PIE countermeasure aims to create an awareness of drunk driving as a serious problem, and to impact specific target audiences with the information and motivation they need to prevent the combination of excessive drinking and driving from occurring. The need for effective PIE programs is documented; and the overall effect they have had in the test sites is evaluated. Questions used in attitude and information surveys are given and the responses tabulated, showing percentage of change in the positive direction after informational campaigns. Among the sites whose programs are covered are Oklahoma City; Tampa, Florida; and Lincoln, Nebraska. Programs involving adolescents and young adults are emphasized. It is concluded that ASAP PIE efforts have achieved a significant impact, especially in providing accurate information about causes, severity, and consequences of the drinking and driving problem.

National Hwy. Traffic Safety Administration, Office of Driver and Pedestrian Traffic Safety Prog., Washington, D.C. 20590
1975; 66p 8refs
Availability: NHTSA

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Ford Motor Co., Environmental
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